221-30116

GC-2014
Service Manual

Analytical & Measuring Instruments Division

Product Guarantee

Thank you for purchasing this product. Shimadzu guarantees this product in the way described below.

1. Guarantee Period
   This product is guaranteed for a period of one year from the date of installation. (This only applies in Japan.)
2. Scope of Guarantee
   If a fault that can be attributed to Shimadzu occurs during the guarantee period, we will perform repair or part replacement as appropriate without charge.
3. Items Beyond the Scope of This Guarantee
   Faults that occur in any of the following cases are beyond the scope of this guarantee, even if they occur within the guarantee period.
   1) A fault occurs as a result of incorrect handling.
   2) A fault occurs as a result of repairs or modifications performed by parties other than Shimadzu or companies designated by Shimadzu.
   3) A fault occurs due to factors unrelated to the equipment itself.
   4) The equipment has been used in a severe environment, for example, subject to high temperatures, high humidity levels, corrosive gases, or vibrations.
   5) A fault occurs as a result of a fire or a natural disaster, such as an earthquake.
   6) The equipment has been moved or transported since initial installation.
   7) A fault occurs in a consumable item or a part dependant on a consumable item.
      Note: Program tape is a consumable item.

Disclaimer

(1) The copyright of this document is the property of Shimadzu Corporation. The unauthorized reproduction or copying of all or any part of this document is not permitted.

(2) In the interests of product improvement, the contents of this document may be changed without notice.

(3) Although every effort has been taken to ensure that the contents of this document are accurate, if an error or omission is discovered, it may not be possible to correct the relevant part immediately.

(4) The supply period for parts required to repair this product is the 7-year period following the termination of manufacture. It may not be possible to respond to requests for repair parts after this period has elapsed. The supply period for parts other than genuine Shimadzu parts, however, is as specified by the original manufacturer.

Introduction

Purpose of This Service Manual

This service manual is intended for use by service engineers approved by Shimadzu Corporation, and describes the maintenance methods used for the GC-2014-series gas chromatograph. Maintenance may only be performed by service engineers who have received training for this instrument.

There may be cases where information on subjects also covered in the instruction manual has been omitted. Refer to the instruction manual if necessary. New information required for maintenance will be issued as *Technical Information*. Insert this information inside this document so that it can be referred to easily.

Disclaimer

Due to product improvement, the parts described and the diagrams given in this document may differ from the actual equipment. Also, not all the parts referred to in this document are handled as repair parts.

Notation Used for Precautionary Information

The precautionary information provided in this service manual is labeled in the following way to indicate the degree of danger, potential damage, and urgency.

⚠ DANGER

- Indicates a hazardous situation which, if not avoided, could result in death, or in serious or moderate injury.

⚠ WARNING

- **Indicates a hazardous situation which, if not avoided, could result in minor injury or property damage.**
  Here, "minor injury" indicates an injury that would not require hospitalization or long-term outpatient care. "Property damage" indicates damage to the product itself and to objects around the product, such as housing and household items.

CAUTION

- Indicates a hazardous situation which, if not avoided, could result in damage to the product or other property damage.

NOTE

- Indicates information provided to facilitate efficient operation of the equipment or clarify the subject matter.

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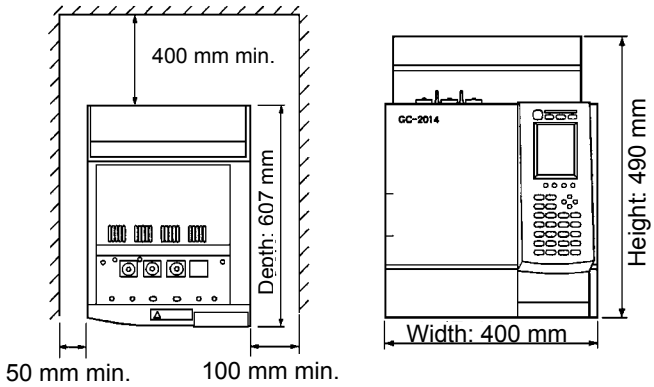
Chapter 1 Installation

1.1 Installation Space

⚠ DANGER

- Hot Air
  Hot air is discharged from the opening. Do not expose flammable objects directly to the hot air.



1.1.1 Rear Space

Hot air is blown out of the exhaust holes at the back of the instrument when the column oven is cooled. Observe the following points when installing the instrument.

- Do not place flammable objects directly behind the instrument.
- Leave a space of at least 40 cm between the back cover and the wall.
- In addition to the space mentioned above, give consideration to the space required for maintenance and inspection.

1.1.2 Side Space

Leave a space of at least 5 cm on the left of the instrument. Leave a space of at least 10 cm on the right of the instrument to enable opening and closing of the oven door.

1.2 Installation Environment

In order to ensure safe, correct use of the instrument, observe the following points when selecting an installation site.

1.2.1 Ambient Temperature and Humidity

In order to maintain performance specifications, use the instrument within the specified temperature and humidity ranges given below.

Specified temperature range: 18ºC to 28ºC
Specified humidity range: 50% to 60%
Operating temperature range: 5ºC to 40ºC
Operating humidity range: 5% to 90% (without condensation)

1.2.2 Installation Surface

Install the instrument on a steady, stable, flat surface.

1.2.3 Corrosive Gas and Dust

In order to attain the specified service life and maintain performance specifications, do not install the instrument in locations subject to large amounts of corrosive gas or dust.

1.2.4 Influence of Electromagnetic Waves and Power-Supply Noise

Do not use this instrument in locations subject to strong electromagnetic waves or use with power supplies that generate high noise levels. Doing so may result in malfunction and it may not be possible to obtain data that conforms to specifications.

1.2.5 Other Precautionary Items

In order to maintain performance specifications, give due consideration to the following points.

(1) Changes in the ambient temperature during operation must be kept to a minimum.
(2) The instrument must not be directly exposed to the airstream emanating from heating or cooling equipment.
(3) The instrument must not be exposed to direct sunlight.
(4) Vibrations must be kept to a minimum.

1.3 Power Supply

⚠ DANGER

High Voltage

- Before connecting the power cable directly to the terminal block in the switchboard, be sure to turn OFF the switchboard switch.
- Be sure to supply power from a power supply incorporating a circuit breaker.
- Do not place heavy objects on the power cable.

Check the following points before connecting the power supply.

1.3.1 Power-Supply Voltage

In order to maintain performance specifications, use a power supply that falls within the following specified power-supply voltage ranges.

	100-VAC specifications	115-VAC specifications	230-VAC specifications
Specified power-supply voltage	95 to 105 VAC 50/60 Hz	110 to 120 VAC 50/60 Hz	219 to 241 VAC 50/60 Hz
Operating power-supply voltage	90 to 110 VAC 50/60 Hz	104 to 126 VAC 50/60 Hz	207 to 253 VAC 50/60 Hz

1.3.2 Power-Supply Capacity

Calculate the power-supply capacity by totaling the power consumption for each of the following parts. Connect the instrument to a terminal with a sufficient capacity.

Unit	Power consumption
Standard model equipped with TCD FID	1,850 VA (100-V model) or 2,650 VA (230-V model)
Additional temperature-control block (e.g., INJ)	150 VA or 200 VA (dual) (for FID and TCD only)

NOTE

- The instrument will not attain its performance specifications if the power-supply voltage is unstable or if the power-supply capacity is insufficient.

1.4 Gas

1.4.1 Purity

In order to maintain performance specifications, prepare the following gases.

Detector	Carrier gas			Detector gas		
	He (recommended)	N_2 (usable)	Other	H_2	Air	Make-up
FID	99.995% min.	99.995% min.		99.995% min.	Compressor air	N_2, He 99.995% min.
FID, high sensitivity	99.999% min.	99.999% min.		99.999% min.	Cylinder air	N_2, He 99.999% min.
TCD	99.995% min.	99.995% min.	Ar, etc. 99.995% min.			He, N_2, Ar, etc. 99.995% min.
TCD, high sensitivity	99.999% min.	99.999% min.	Ar, etc. 99.999% min.			He, N_2, Ar, etc. 99.999% min.
ECD	99.999% min.	99.999% min.				N_2 99.999% min.
ECD, high sensitivity	99.9999% min.	99.9999% min.				N_2 99.9999% min.
FPD	99.999% min.	99.999% min.		99.999% min.	Cylinder air	
FTD	99.999% min.			99.999% min.	Cylinder air	He 99.999% min.

* Use air that has been compressed in an oil-less compressor and then dehumidified.

1.4.2 Supply Pressure

Carrier gas: 300 to 980 kPa
Make-up gas: 300 to 980 kPa
Hydrogen: 300 to 500 kPa
Air: 300 to 500 kPa

Use the following formulas for approximate conversion between kPa and kgf/cm^2.

1 kPa = 1.02 × 10^{-2} kgf/ cm^2

1 kgf/ cm^2 = 98.1 kPa

Use the following formulas for approximate conversion between kPa and psi.

1 kPa = 1.45 × 10^{-1} psi

1 psi = 6.89 kPa

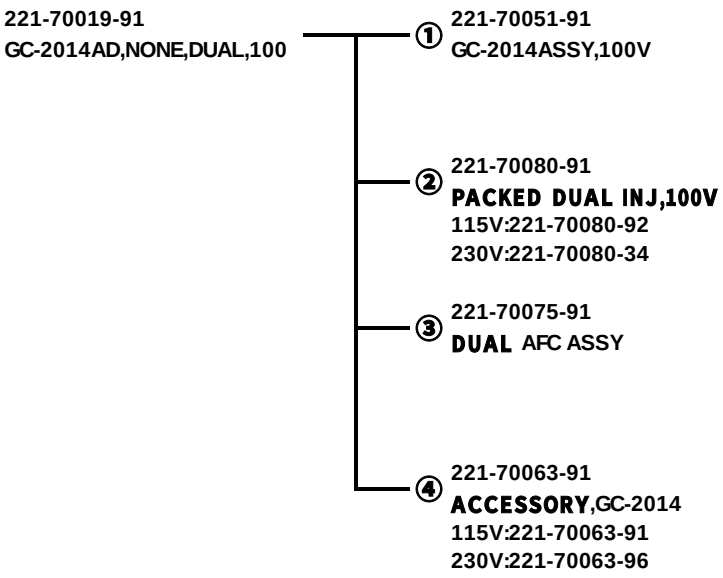
NOTE

- For precautions on handling high-pressure gas cylinders and using hydrogen gas, refer to the instruction manual for the GC-2014 main unit.

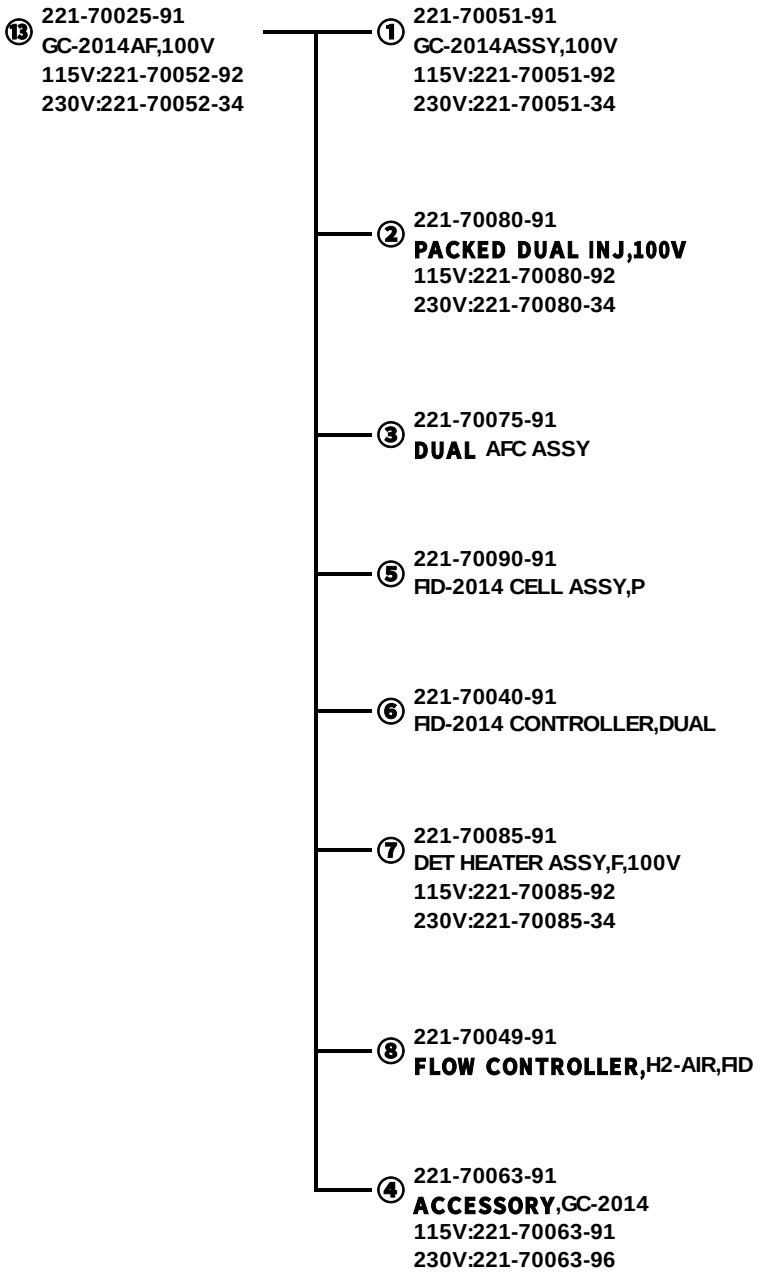
Chapter 2 Configuration of GC-2014

2.1 Configuration Diagrams for GC-2014 Series

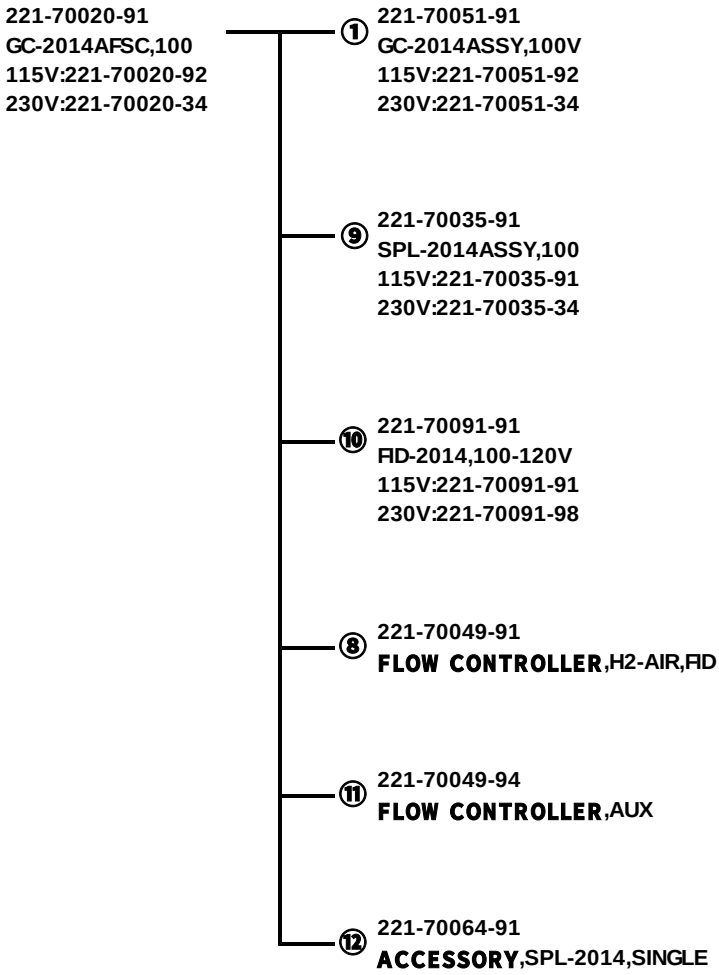
2.1.1 GC-2014A



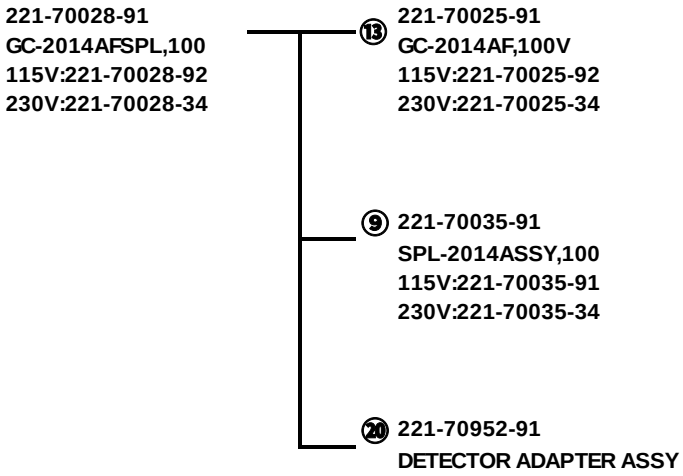
2.1.2 GC-2014AF



2.1.3 GC-2014AFsc



2.1.4 GC-2014AFSPL

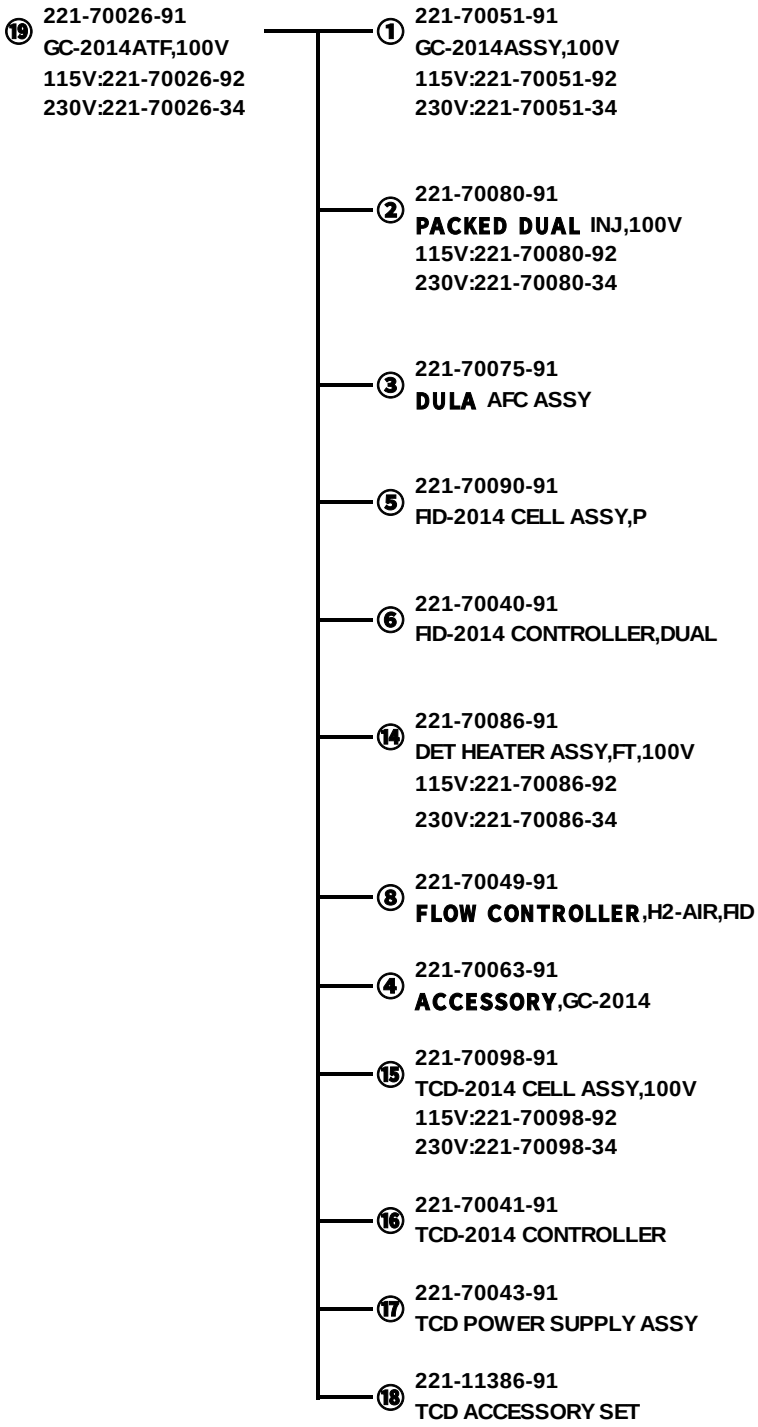


2.1.5 GC-2014AT

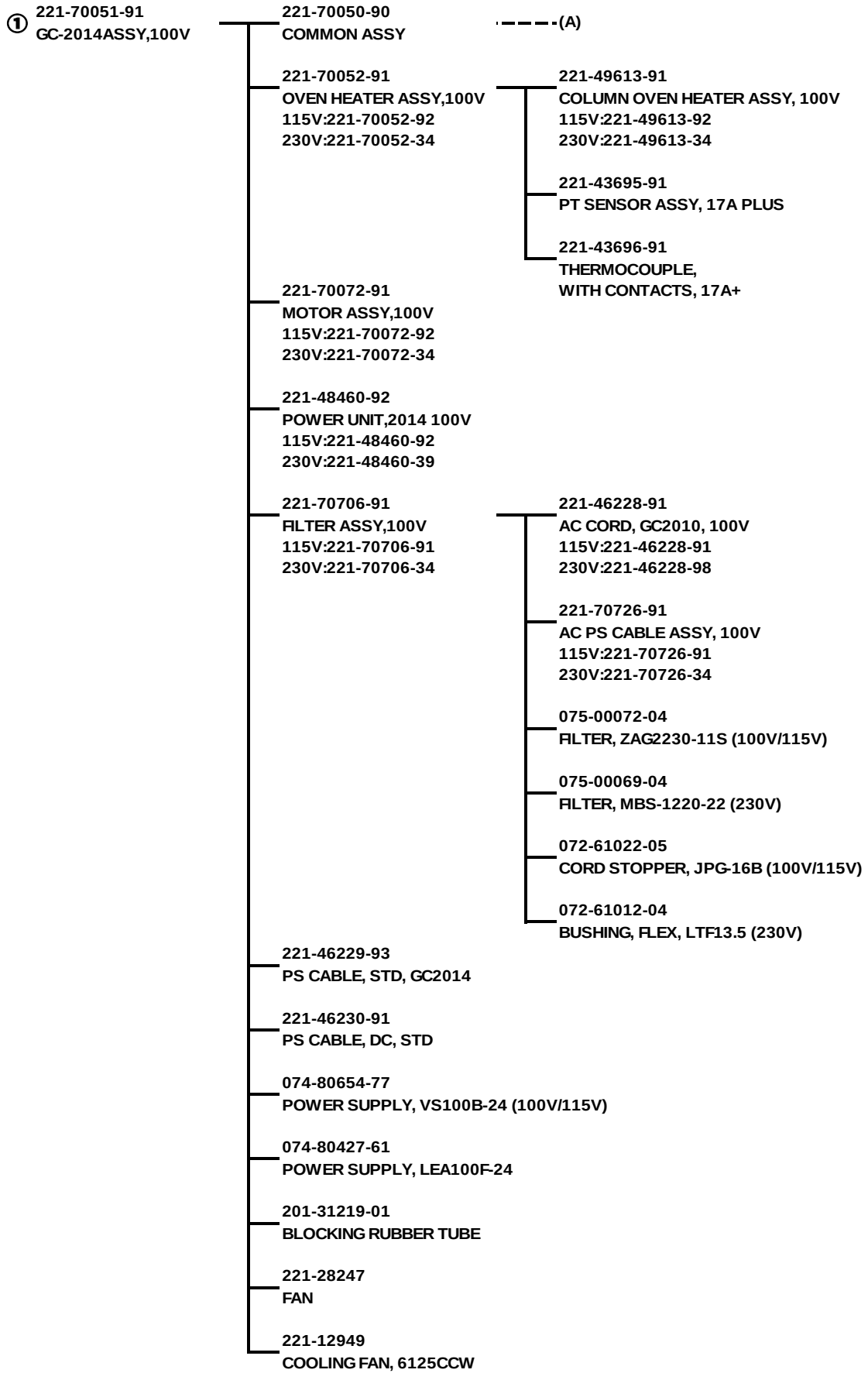
221-70027-91
GC-2014,AT100V
115V:221-70027-92
230V:221-70027-34

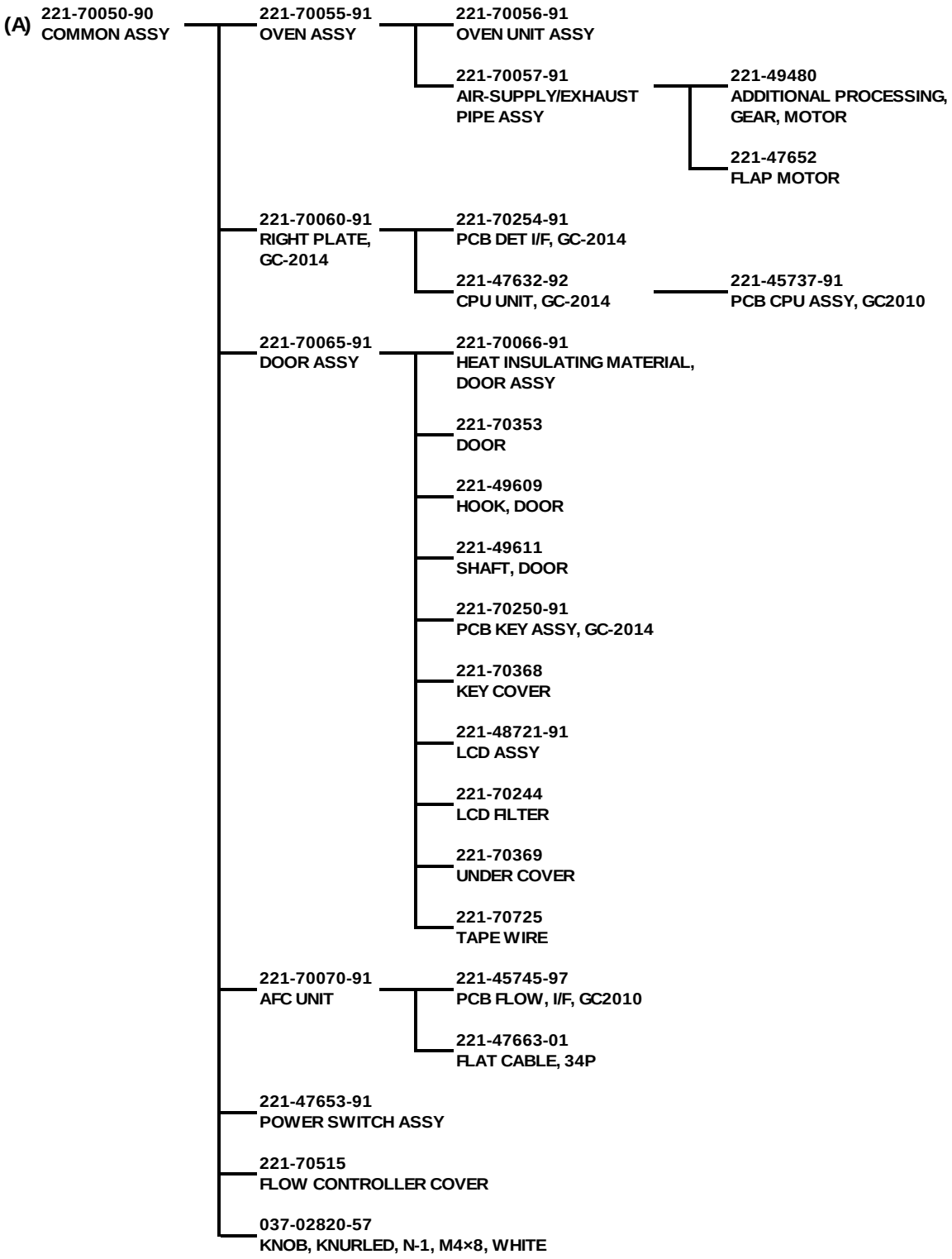
- ① **221-70051-91**
  GC-2014ASSY,100V
  115V:221-70051-92
  230V:221-70051-34
- ② **221-70080-91**
  PACKED DUAL INJ,100V
  115V:221-70080-92
  230V:221-70080-34
- ③ **221-70075-91**
  DUAL AFC ASSY
- ⑭ **221-70086-91**
  DET HEATER ASSY,FT,100V
  115V:221-70086-92
  230V:221-70086-34
- ④ **221-70063-91**
  ACCESSORY,GC-2014
  115V:221-70063-91
  230V:221-70063-96
- ⑮ **221-70098-91**
  TCD-2014 CELL ASSY,100V
  115V:221-70098-91
  230V:221-70098-34
- ⑯ **221-70041-91**
  TCD-2014 CONTROLLER
- ⑰ **221-70043-91**
  TCD POWER SUPPLY ASSY
- ⑱ **221-11386-91**
  TCD ACCESSORY SET

2.1.6 GC-2014ATF



2.1.7 GC-2014ATFSPL


① 221-70051-91
GC-2014ASSY,100V
221-70050-90
COMMON ASSY
(A)
221-70052-91
OVEN HEATER ASSY,100V
115V:221-70052-92
230V:221-70052-34
221-49613-91
COLUMN OVEN HEATER ASSY, 100V
115V:221-49613-92
230V:221-49613-34
221-43695-91
PT SENSOR ASSY, 17A PLUS
221-43696-91
THERMOCOUPLE,
WITH CONTACTS, 17A+
221-70072-91
MOTOR ASSY,100V
115V:221-70072-92
230V:221-70072-34
221-48460-92
POWER UNIT,2014 100V
115V:221-48460-92
230V:221-48460-39
221-70706-91
FILTER ASSY,100V
115V:221-70706-91
230V:221-70706-34
221-46228-91
AC CORD, GC2010, 100V
115V:221-46228-91
230V:221-46228-98
221-70726-91
AC PS CABLE ASSY, 100V
115V:221-70726-91
230V:221-70726-34
075-00072-04
FILTER, ZAG2230-11S (100V/115V)
075-00069-04
FILTER, MBS-1220-22 (230V)
072-61022-05
CORD STOPPER, JPG-16B (100V/115V)
072-61012-04
BUSHING, FLEX, LTF13.5 (230V)
221-46229-93
PS CABLE, STD, GC2014
221-46230-91
PS CABLE, DC, STD
074-80654-77
POWER SUPPLY, VS100B-24 (100V/115V)
074-80427-61
POWER SUPPLY, LEA100F-24
201-31219-01
BLOCKING RUBBER TUBE
221-28247
FAN
221-12949
COOLING FAN, 6125CCW


(A)
221-70050-90
COMMON ASSY
221-70055-91
OVEN ASSY
221-70056-91
OVEN UNIT ASSY
221-70057-91
AIR-SUPPLY/EXHAUST
PIPE ASSY
221-49480
ADDITIONAL PROCESSING,
GEAR, MOTOR
221-47652
FLAP MOTOR
221-70060-91
RIGHT PLATE,
GC-2014
221-70254-91
PCB DET I/F, GC-2014
221-47632-92
CPU UNIT, GC-2014
221-45737-91
PCB CPU ASSY, GC2010
221-70065-91
DOOR ASSY
221-70066-91
HEAT INSULATING MATERIAL,
DOOR ASSY
221-70353
DOOR
221-49609
HOOK, DOOR
221-49611
SHAFT, DOOR
221-70250-91
PCB KEY ASSY, GC-2014
221-70368
KEY COVER
221-48721-91
LCD ASSY
221-70244
LCD FILTER
221-70369
UNDER COVER
221-70725
TAPE WIRE
221-70070-91
AFC UNIT
221-45745-97
PCB FLOW, I/F, GC2010
221-47663-01
FLAT CABLE, 34P
221-47653-91
POWER SWITCH ASSY
221-70515
FLOW CONTROLLER COVER
037-02820-57
KNOB, KNURLED, N-1, M4×8, WHITE

② 221-70080-91
PACKED DUAL INJ,100V
115V:221-70080-92
230V:221-70080-34

- 221-70189-91
  INJECTION UNIT ASSY,122
- 221-70479-91
  HETER,PT ASSY,P-INJ100
  115V:221-70479-92
  230V:221-70479-34
  - 221-70484-91
    HEATER, 100V/150W ASSY
    115V:221-70484-92
    230V:221-70484-34
  - 221-70596-91
    HEAT SENSITIVE MATERIAL, INJ
  - 050-73001-79
    R, RN AXIAL, 1/2W, 1802F
- 221-44584
  GUIDE, FOR NEEDLE FIN, AOC
- 221-70466
  FIN, 2014
- 221-22206
  SPACER, INJ

⑤ 221-70090-91
FID-2014 CELL ASSY,P

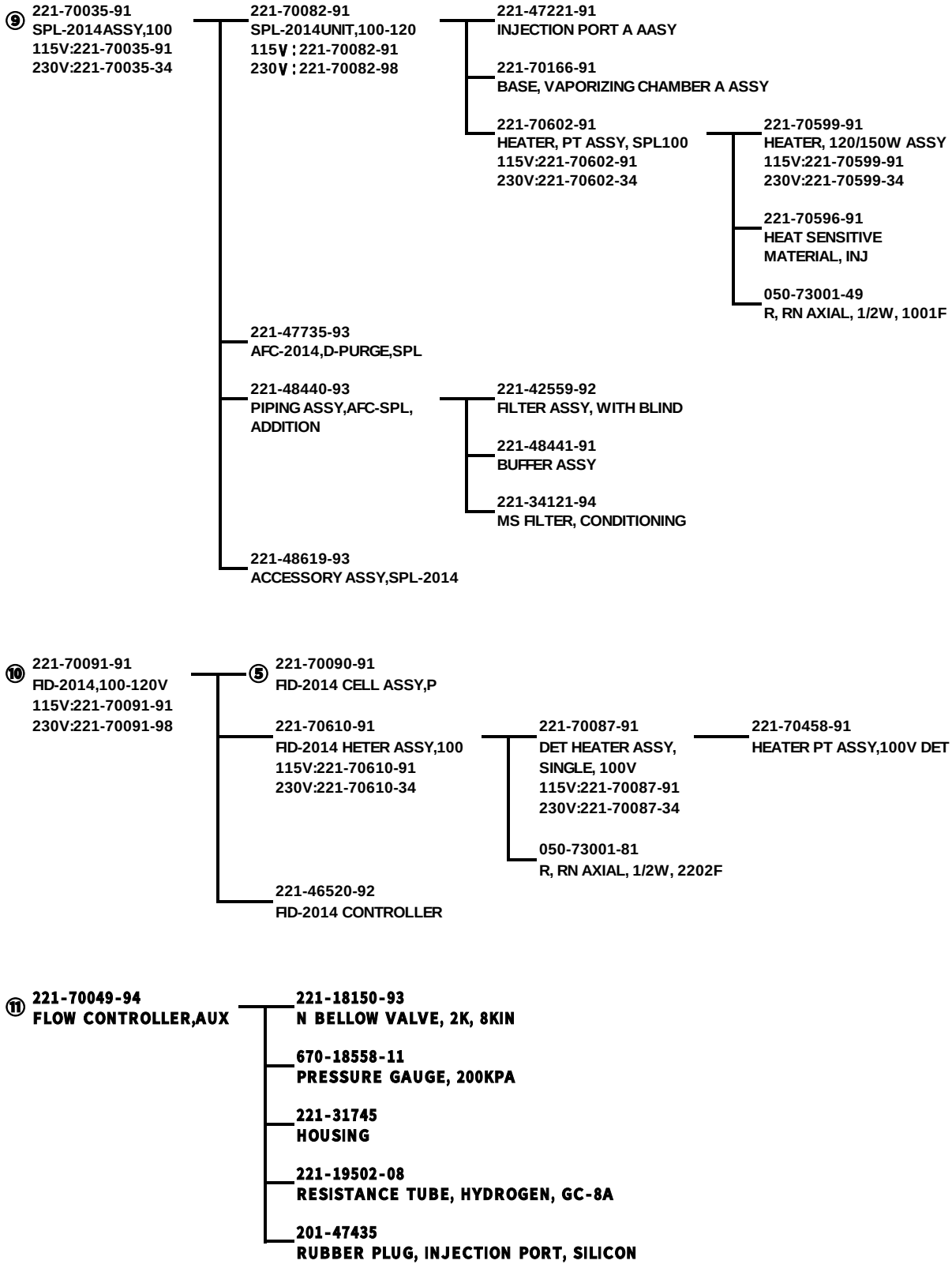
- 221-70630-91
  FID-2014 CELL BASE ASSY
  - 221-70298-91
    BASE, MAIN ASSY, FID
  - 221-70162-92
    NOZZLE ASSY, PACKED
  - 221-47146-92
    HIGH VOLTAGE ELECTRODE, FID2014
- 221-47659-92
  COLLECTOR ASSY, FID, 600MM
- 221-41847-93
  FILAMENT ASSY, 180MM

⑦ 221-70085-91
DET HEATER ASSY,F,100V
115V:221-70085-92
230V:221-70085-34

- 221-70671-91
  HEATER,PT ASSY,D-FID 100
  115V:221-70671-92
  230V:221-70761-34

⑧ 221-70049-91
FLOW CONTROLLER,
H2-AIR,FID

- 221-18150-91
  N BELLOW VALVE, 2K
- 221-41511-91
  N BELLOW VALVE, 2K,
  WITH RESISTANCE
  - 221-41510
    METAL CAP, REPROCESSED,
    WITH RESISTANCE
  - 221-18150-91
    N BELLOW VALVE, 2K
- 670-18558-11
  PRESSURE GAUGE, 200KPA
- 221-70483-91
  SOLENOID VALVE ASSY
- 042-40043-02
  SPEED CONTROLLER, ASN-M5
- 221-31745
  HOUSING
- 221-19502-08
  RESISTANCE TUBE, HYDROGEN, GC-8A
- 201-47435
  RUBBER PLUG, INJECTION PORT, SILICON
- 221-19503-08
  RESISTANCE TUBE, AIR, GC-8AF


⑨ 221-70035-91
SPL-2014ASSY,100
115V:221-70035-91
230V:221-70035-34
221-70082-91
SPL-2014UNIT,100-120
115V ; 221-70082-91
230V ; 221-70082-98
221-47221-91
INJECTION PORT A AASY
221-70166-91
BASE, VAPORIZING CHAMBER A ASSY
221-70602-91
HEATER, PT ASSY, SPL100
115V:221-70602-91
230V:221-70602-34
221-70599-91
HEATER, 120/150W ASSY
115V:221-70599-91
230V:221-70599-34
221-70596-91
HEAT SENSITIVE
MATERIAL, INJ
050-73001-49
R, RN AXIAL, 1/2W, 1001F
221-47735-93
AFC-2014,D-PURGE,SPL
221-48440-93
PIPING ASSY,AFC-SPL,
ADDITION
221-42559-92
FILTER ASSY, WITH BLIND
221-48441-91
BUFFER ASSY
221-34121-94
MS FILTER, CONDITIONING
221-48619-93
ACCESSORY ASSY,SPL-2014
⑩ 221-70091-91
FID-2014,100-120V
115V:221-70091-91
230V:221-70091-98
⑤ 221-70090-91
FID-2014 CELL ASSY,P
221-70610-91
FID-2014 HETER ASSY,100
115V:221-70610-91
230V:221-70610-34
221-70087-91
DET HEATER ASSY,
SINGLE, 100V
115V:221-70087-91
230V:221-70087-34
221-70458-91
HEATER PT ASSY,100V DET
050-73001-81
R, RN AXIAL, 1/2W, 2202F
221-46520-92
FID-2014 CONTROLLER
⑪ 221-70049-94
FLOW CONTROLLER,AUX
221-18150-93
N BELLOW VALVE, 2K, 8KIN
670-18558-11
PRESSURE GAUGE, 200KPA
221-31745
HOUSING
221-19502-08
RESISTANCE TUBE, HYDROGEN, GC-8A
201-47435
RUBBER PLUG, INJECTION PORT, SILICON

*

⑭ 221-70086-91
DET HEATER ASSY,FT,100V
115V:221-70086-92
230V:221-70086-34

- 221-70671-91
  HEATER,PT ASSY,D-FID 100
  115V:221-70671-92
  230V:221-70761-34

⑮ 221-70098-91
TCD-2014 CELL ASSY,100V
115V:221-70098-91
230V:221-70098-34

- 221-70743-91
  HOT PLATE ASSY, 2014, 100V
  115V:221-70743-91
  230V:221-70743-34
- 221-32577-91
  PIPE ASSY, COL-TCD1
- 221-32577-92
  PIPE ASSY, COL-TCD2
- 221-70744-91
  TCD, 100 OHMS, 2014
- 221-13964-91
  PIPE, BENT

- 221-70741-91
  HEATER PT ASSY, TCD, 100
  115V:221-70741-91
  230V:221-70741-34

- 221-70742-91
  HEATER ASSY, 100V, 200W
  115V:221-70742-92
  230V:221-70742-34
- 221-70740-91
  HEAT SENSITIVE
  MATERIAL, TCD
- 050-73001-85
  R, RN AXIAL, 1/2W, 3302F

⑰ 221-70043-91
TCD POWER SUPPLY ASSY

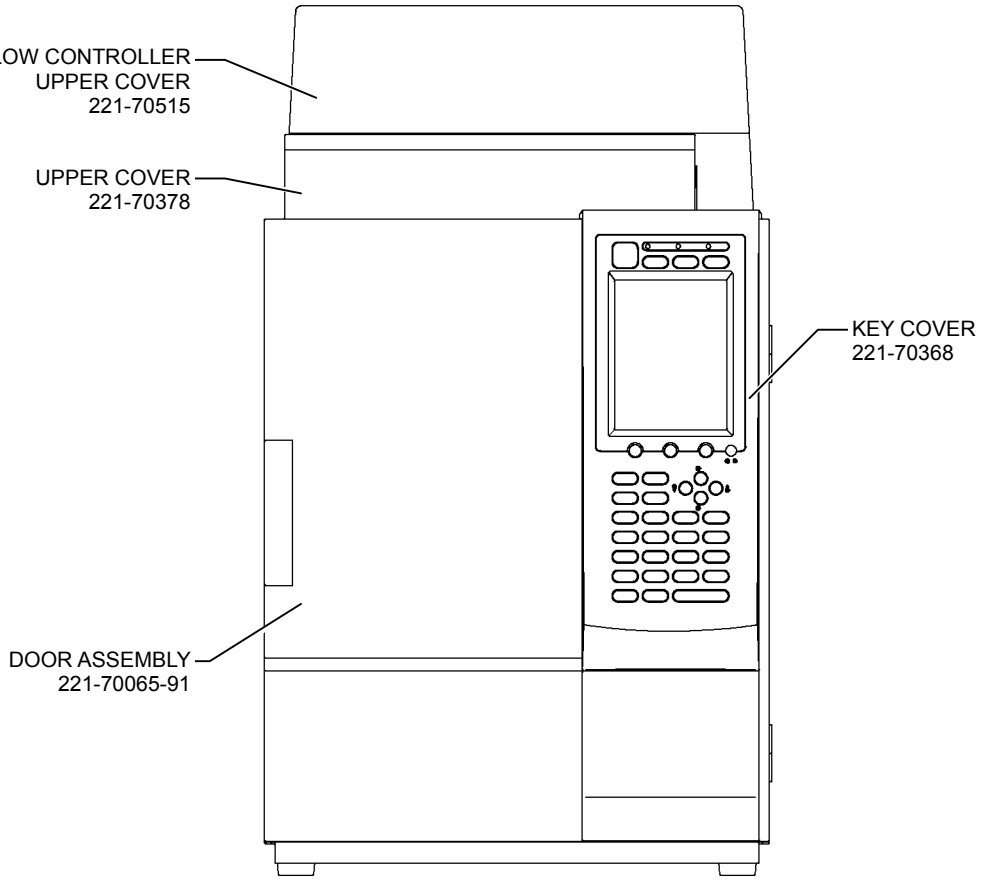
- 074-80383-82
  POWER SUPPLY, ZWS30-48/J
- 221-46229-94
  PS CABLE, AC, AUX, 2014
- 221-70669-91
  PS CABLE, TCD, DC

⑳ 221-70952-91
DETECTOR ADAPTER ASSY

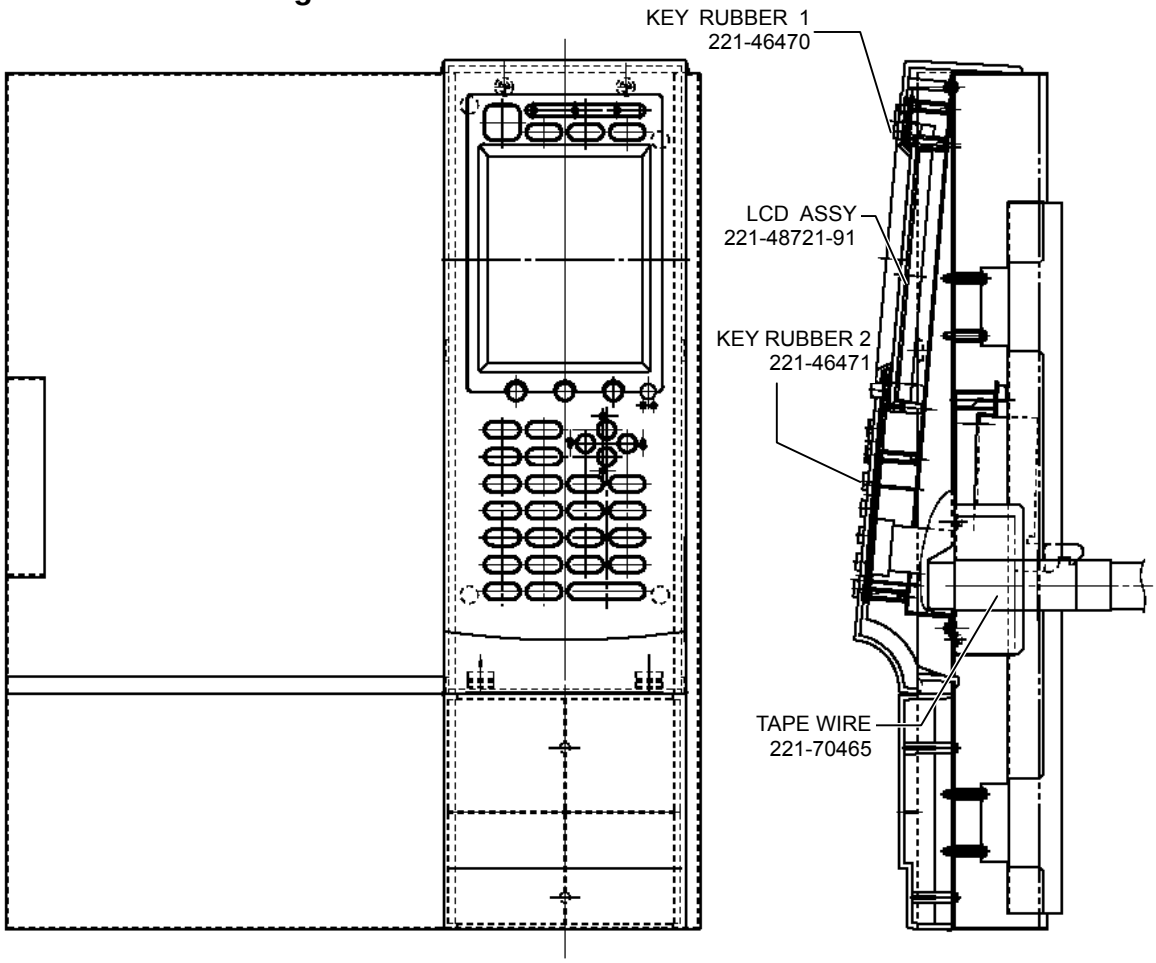
- 221-34012-91
  WBC, DET ADAPTER, WITH PURGE
- 221-15561-92
  JOINT SET, DET ADAPTER
- 221-15563-91
  GRAPHITE FERRULE, FOUR

2.2 Structure of GC-2014

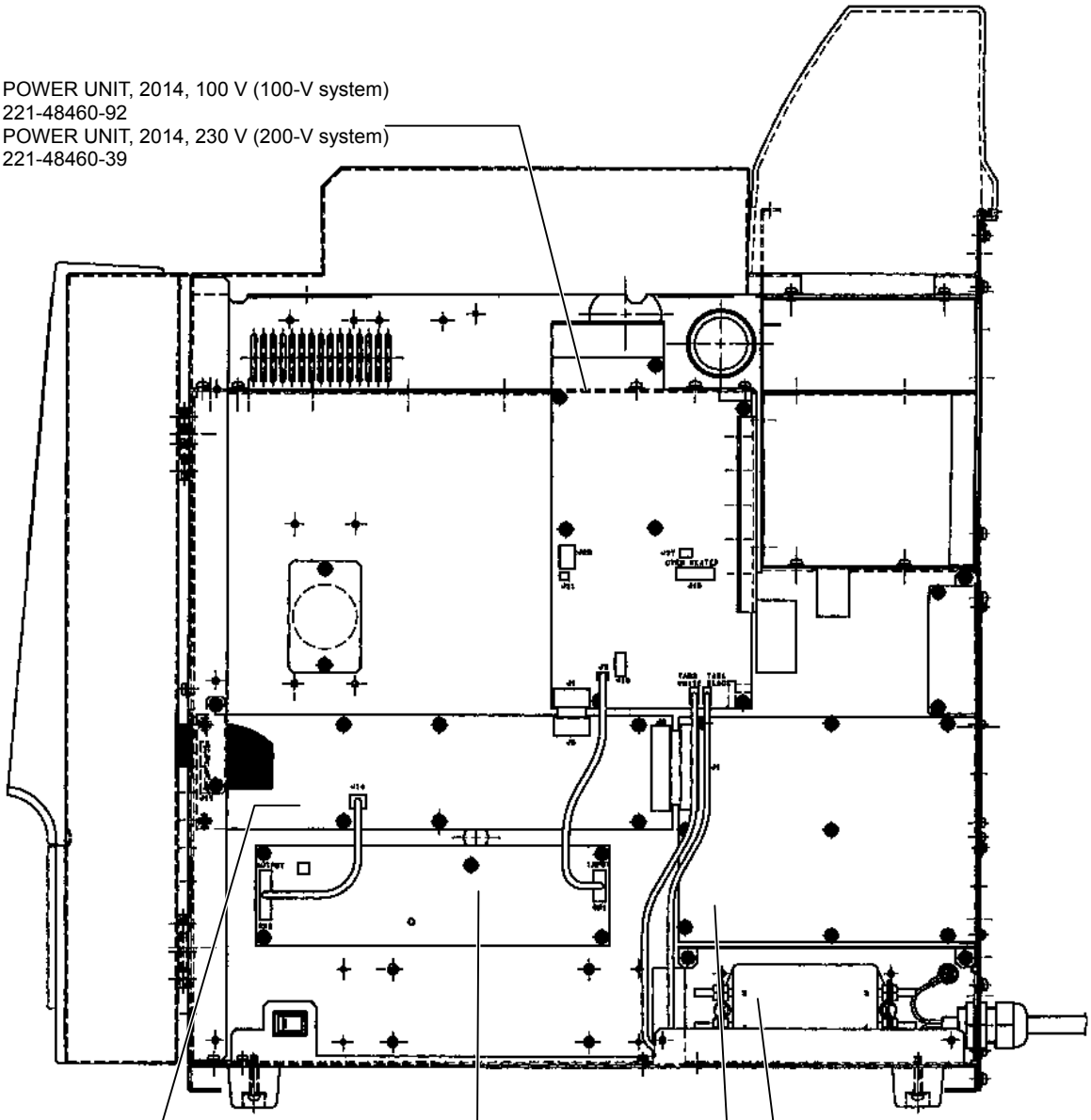
2.2.1 External Appearance



2.2.2 Structure Diagram 1

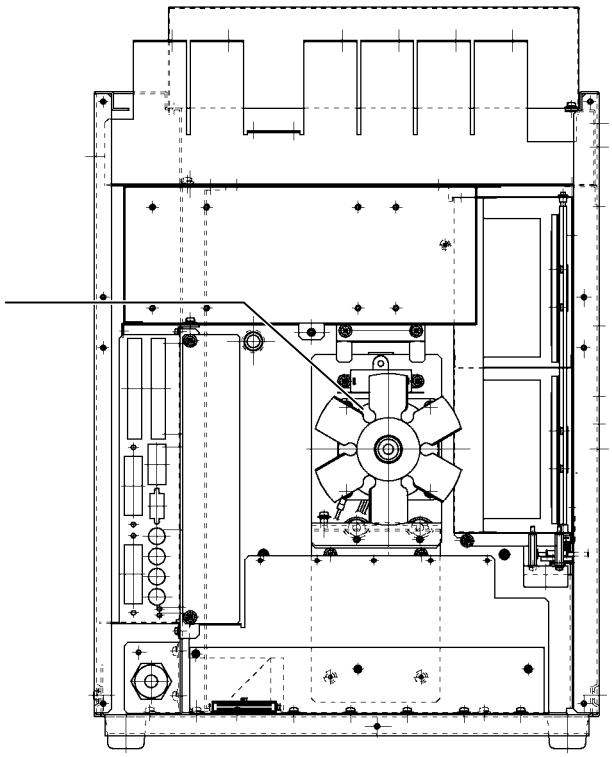


2.2.3 Structure Diagram 2

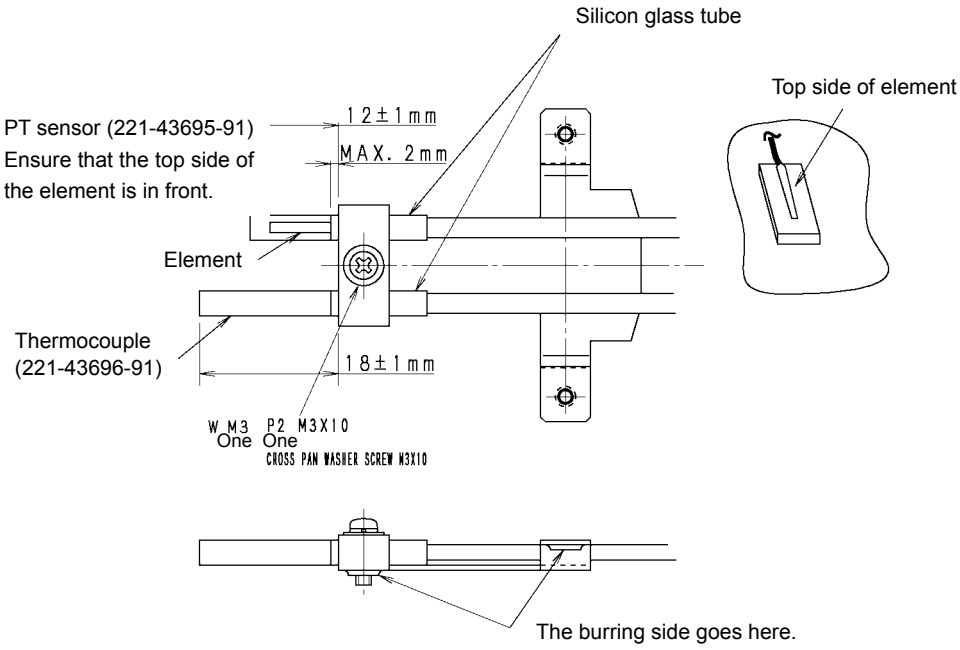


2.2.4 Structure Diagram 3

MOTOR ASSY
221-70072-91
MOTOR ASSY, 115
221-70072-92
MOTOR ASSY, 230
221-70072-34



2.2.5 PT Sensor and Thermocouple

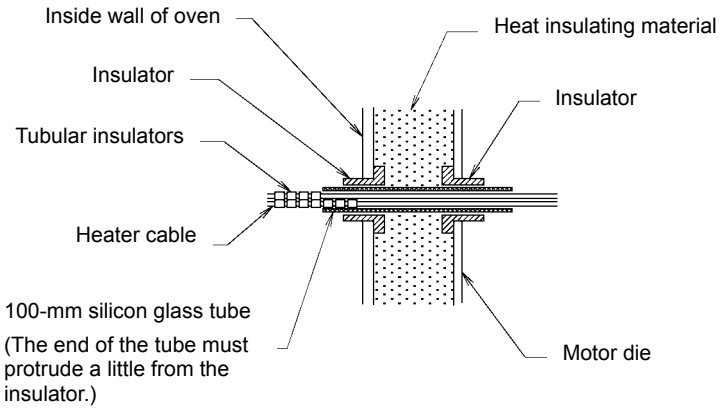


2.2.6 Heater and PT Sensor/Thermocouple

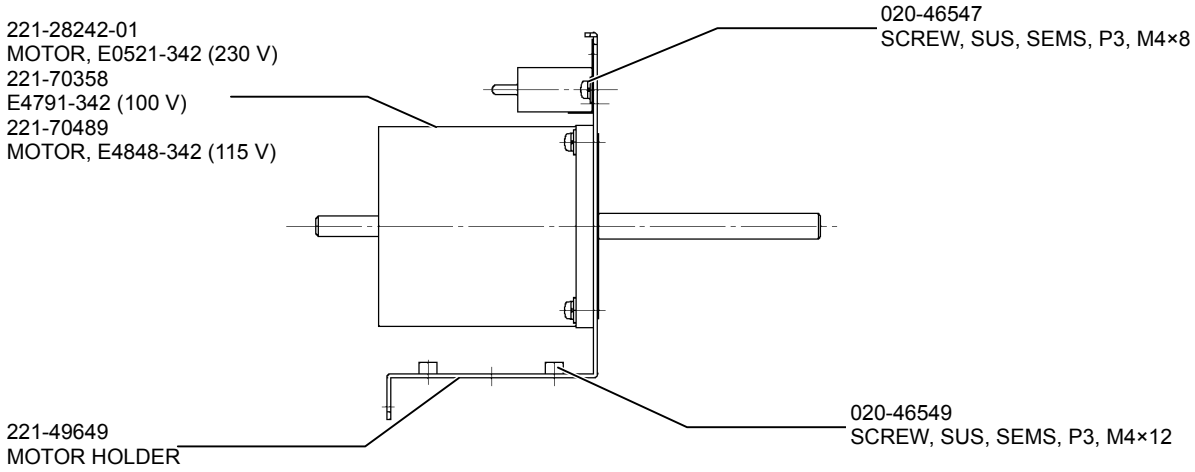
HEATER ASSY

	Part number/name	Heater resistance value
100 V	P/N: 221-43652-91 COLUMN OVEN HEATER ASSY, 100 V, 1.3 kW	7.1 to 7.9 Ω
200 V	P/N: 221-46381-94 COLUMN OVEN HEATER ASSY, 230 V, 2.1 kW	24.6 to 25.8 Ω

Rear Side

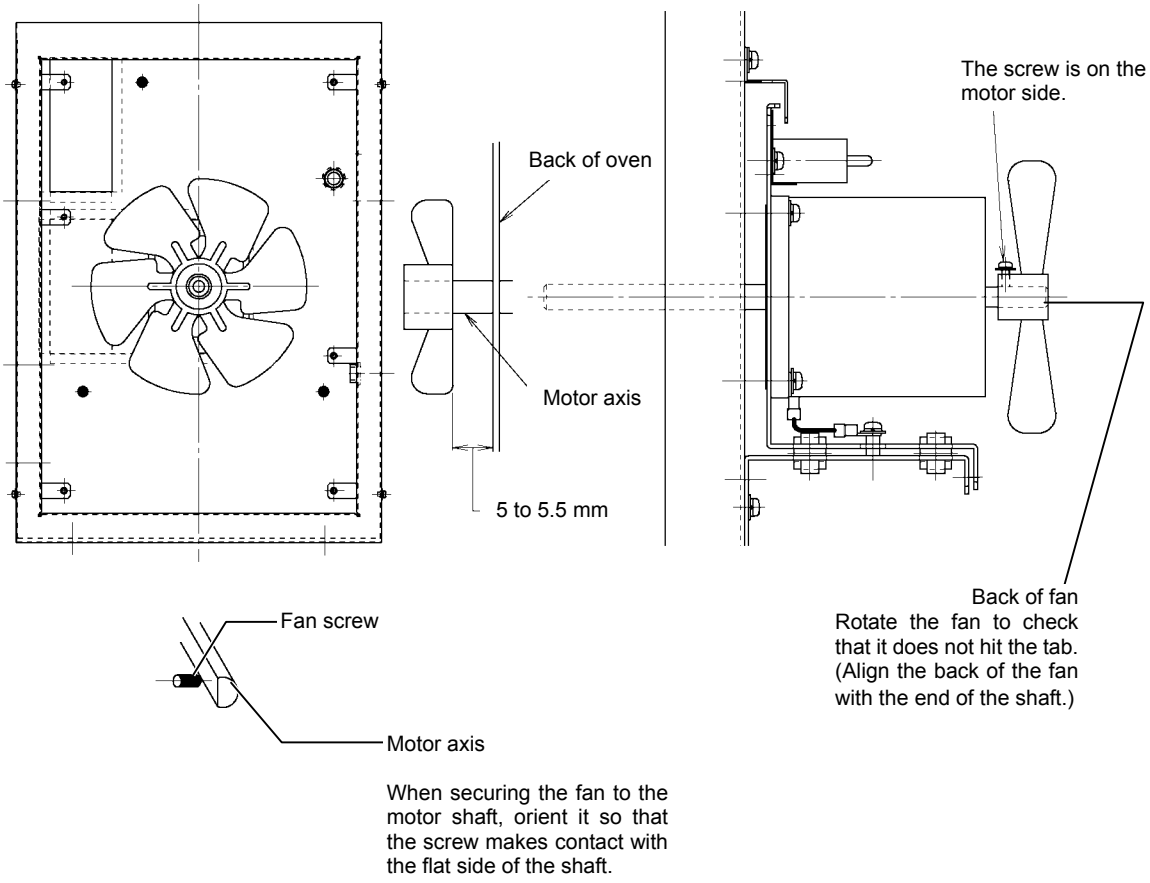


2.2.7 Fan Motor

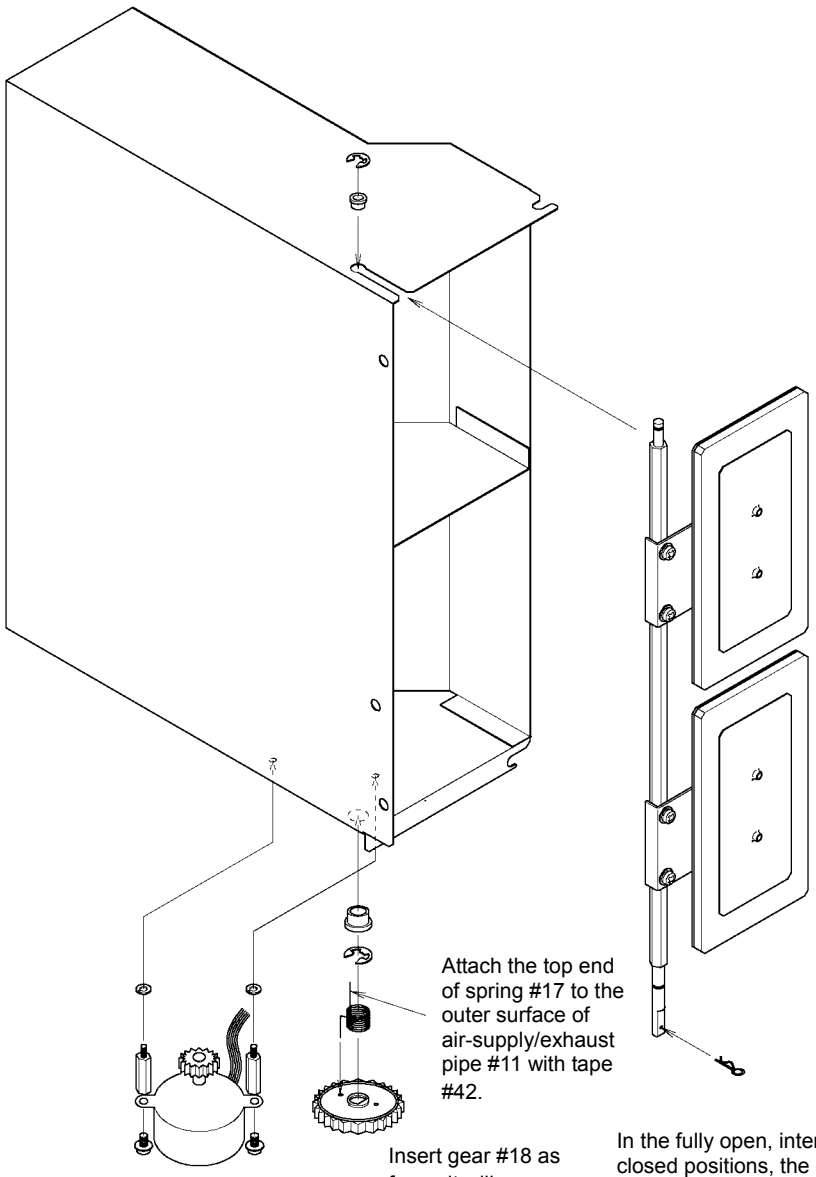


2.2.8 Fan

When the fan (P/N: 221-28247) is mounted onto the motor shaft and pushed to the position where it touches the back of the oven, if the motor shaft protrudes at least 5 mm in the front of the fan, mount the fan with its outer face (i.e., the back) in alignment with the end of the shaft. If the motor shaft protrudes less than 5 mm, then the fan must be pulled forwards so that the outer face is an appropriate distance in front of the end of shaft. It is secured in this state using the screw provided with the fan.

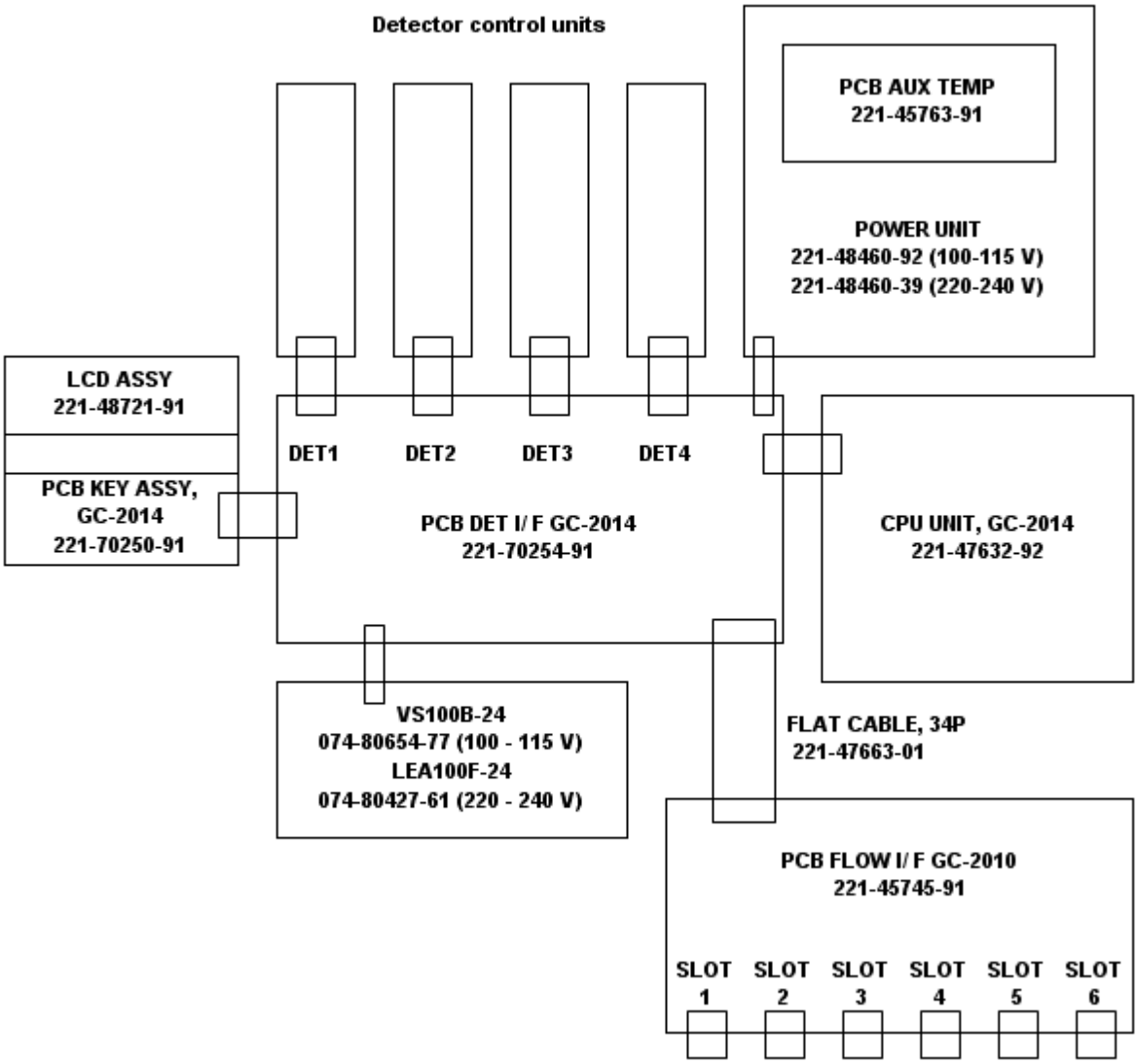


2.2.9 Structure of Oven Cooling Unit



2.3 Electric Circuits

2.3.1 Block Diagram



Note:

- One AFC can be mounted to one odd-numbered slot and one even-numbered slot.
- The AFCs are recognized as CAR1 and CAR2 in order of increasing slot number.

Fig. 2.3.1 Block Diagram

2.3.2 CPU Unit

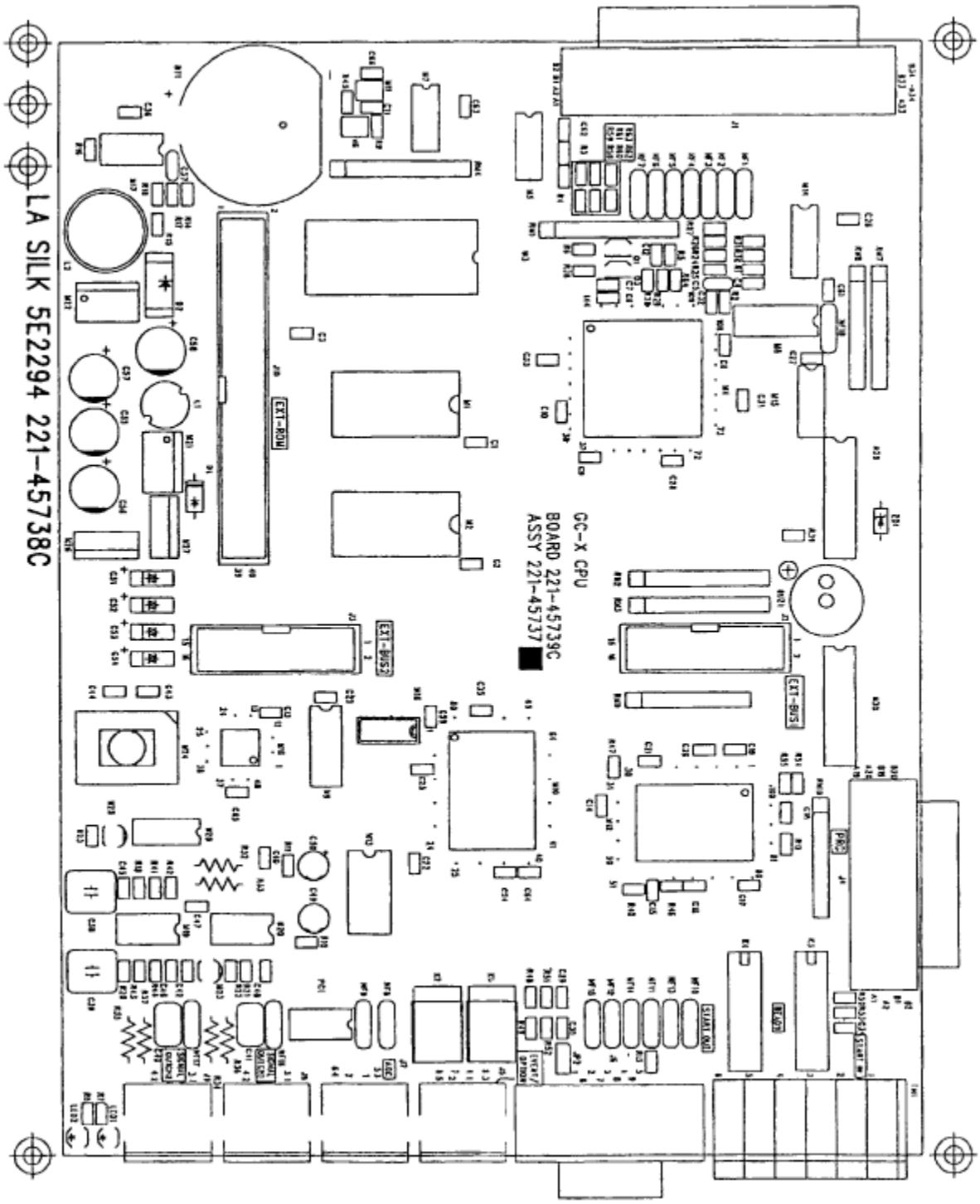


Fig. 2.3.2 Assembly Diagram for CPU Unit

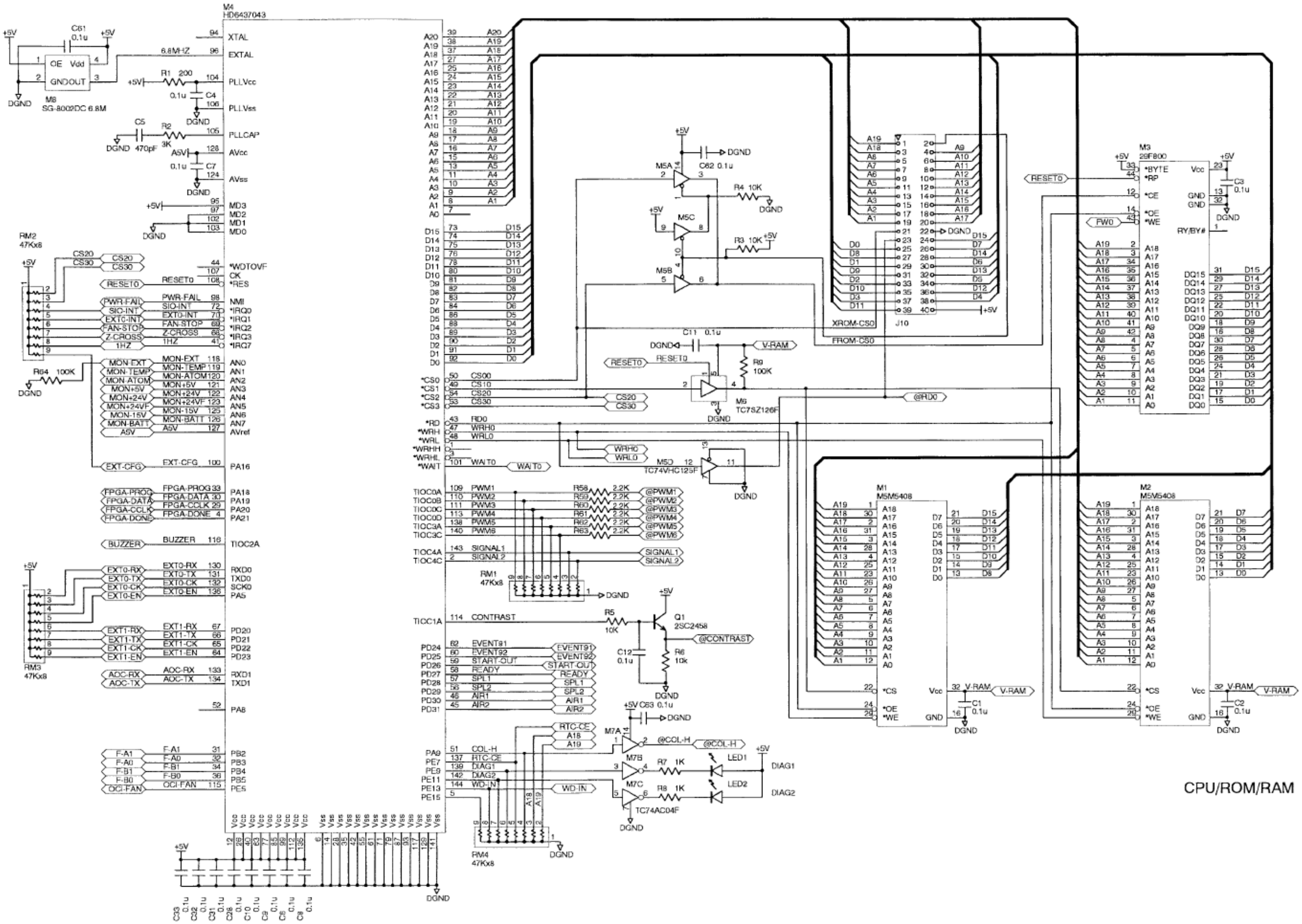


Fig. 2.3.3 Circuit Diagram for CPU Unit (1/4)

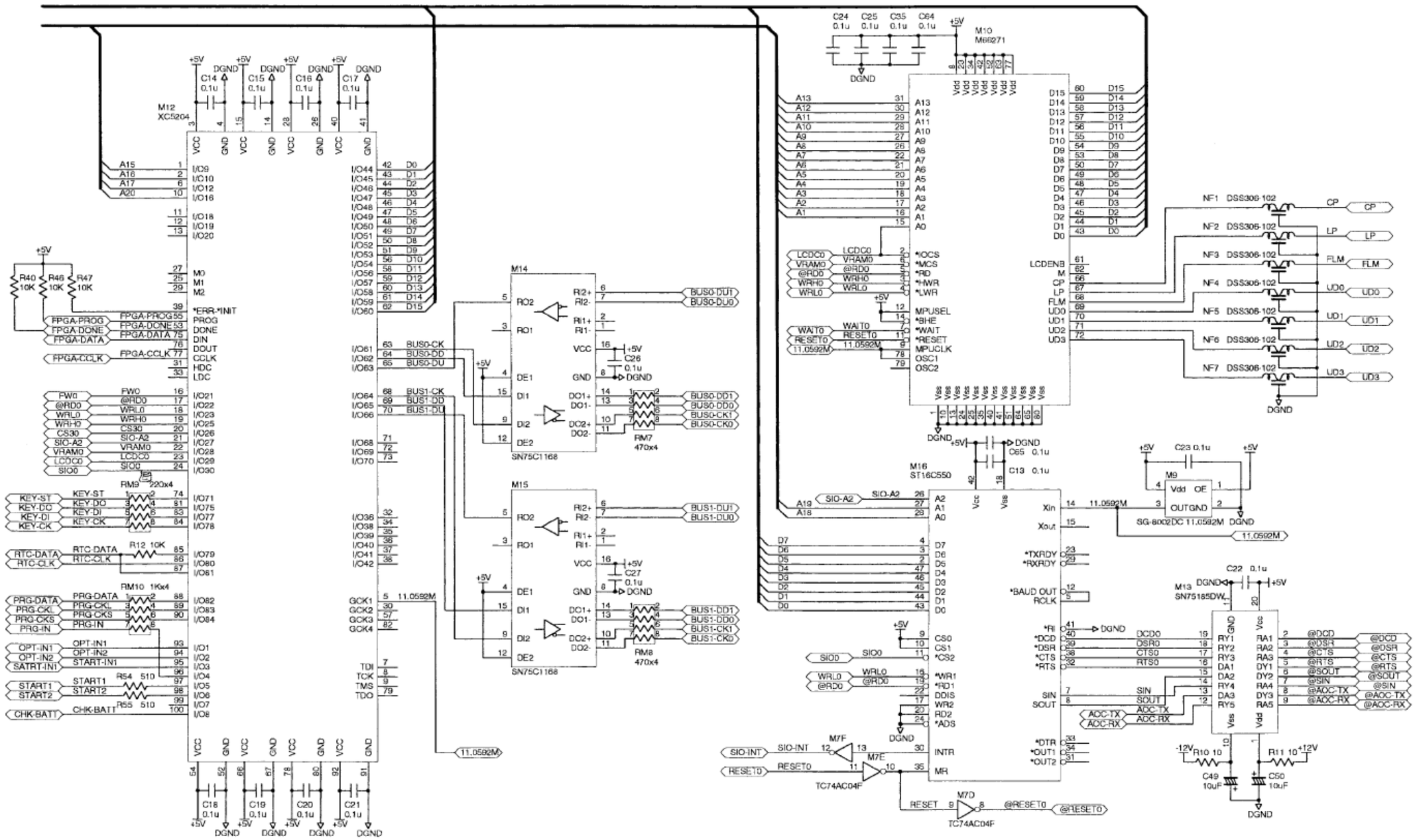


Fig. 2.3.4 Circuit Diagram for CPU Unit (2/4)

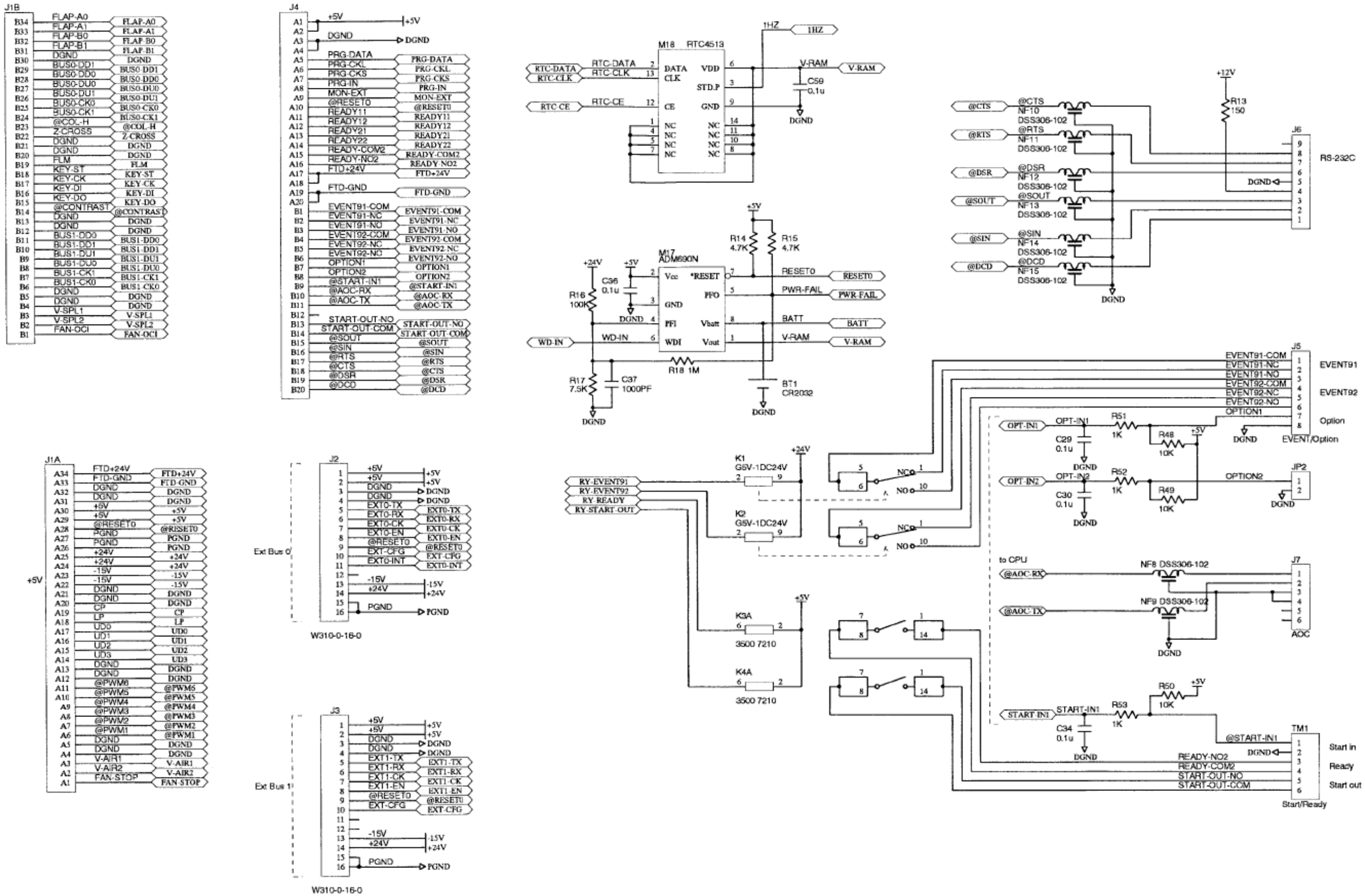


Fig. 2.3.5 Circuit Diagram for CPU Unit (3/4)

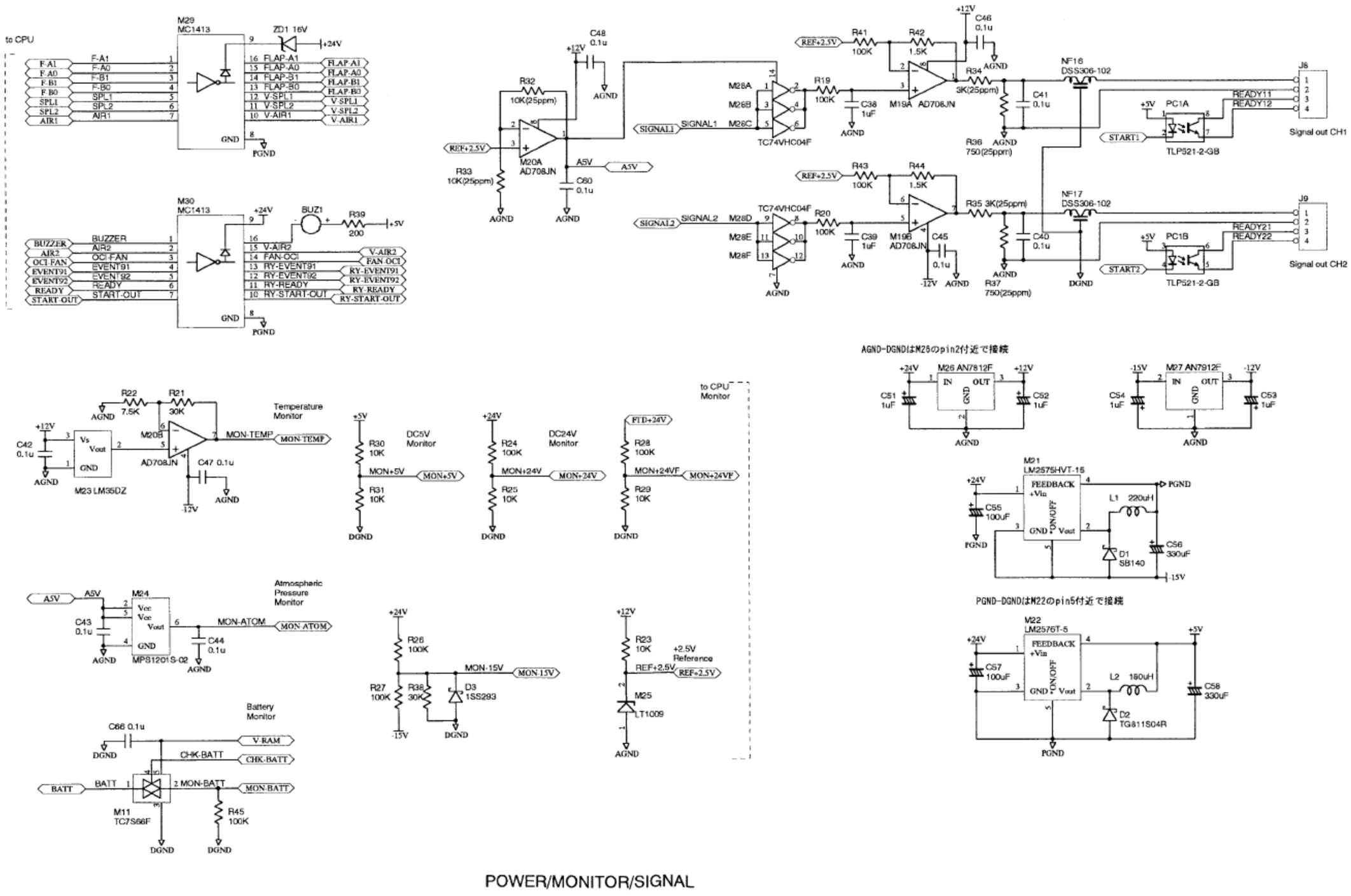


Fig. 2.3.6 Circuit Diagram for CPU Unit (4/4)

2.3.3 Power Unit

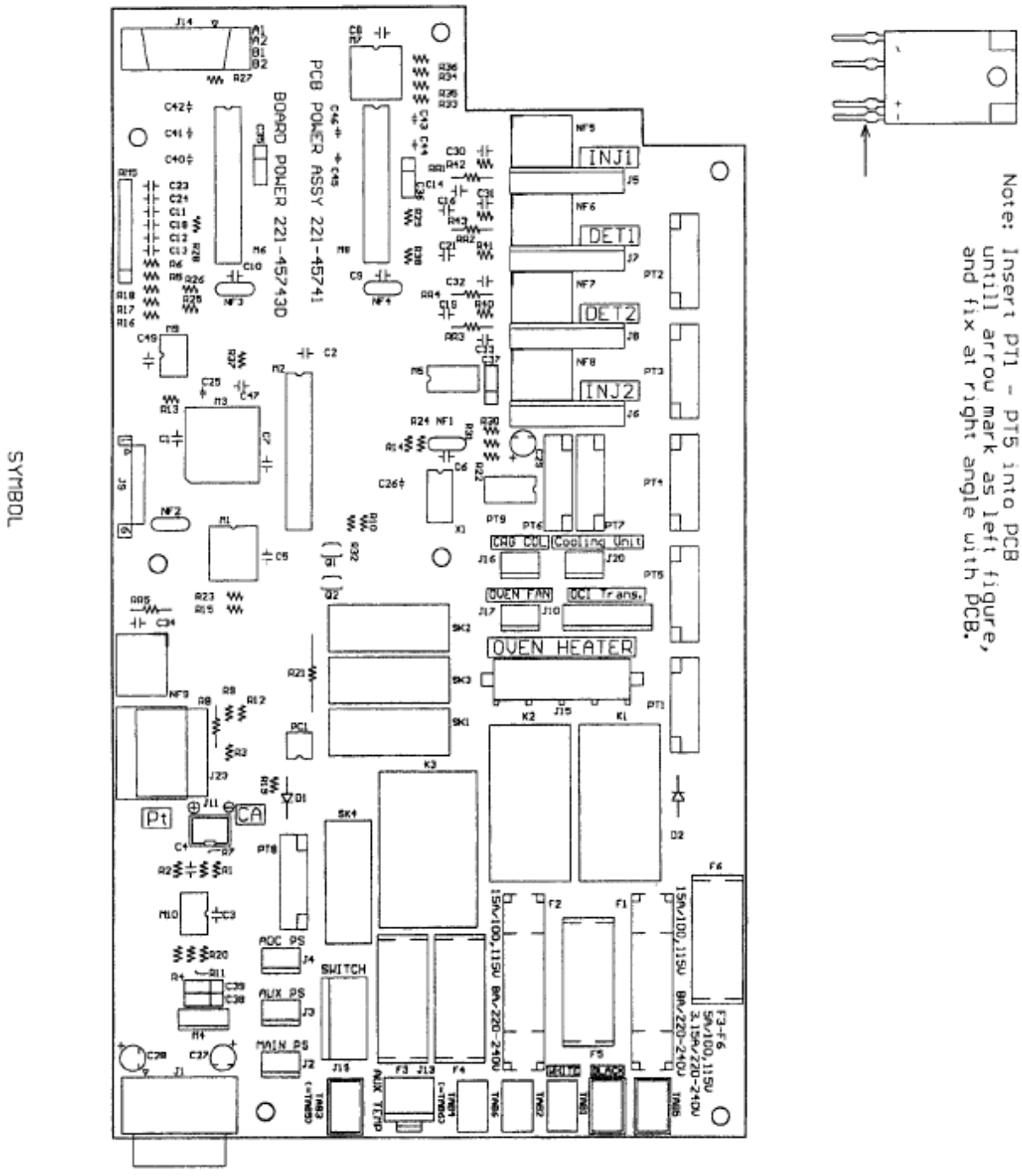


Fig. 2.3.7 Assembly Diagram for Power Unit

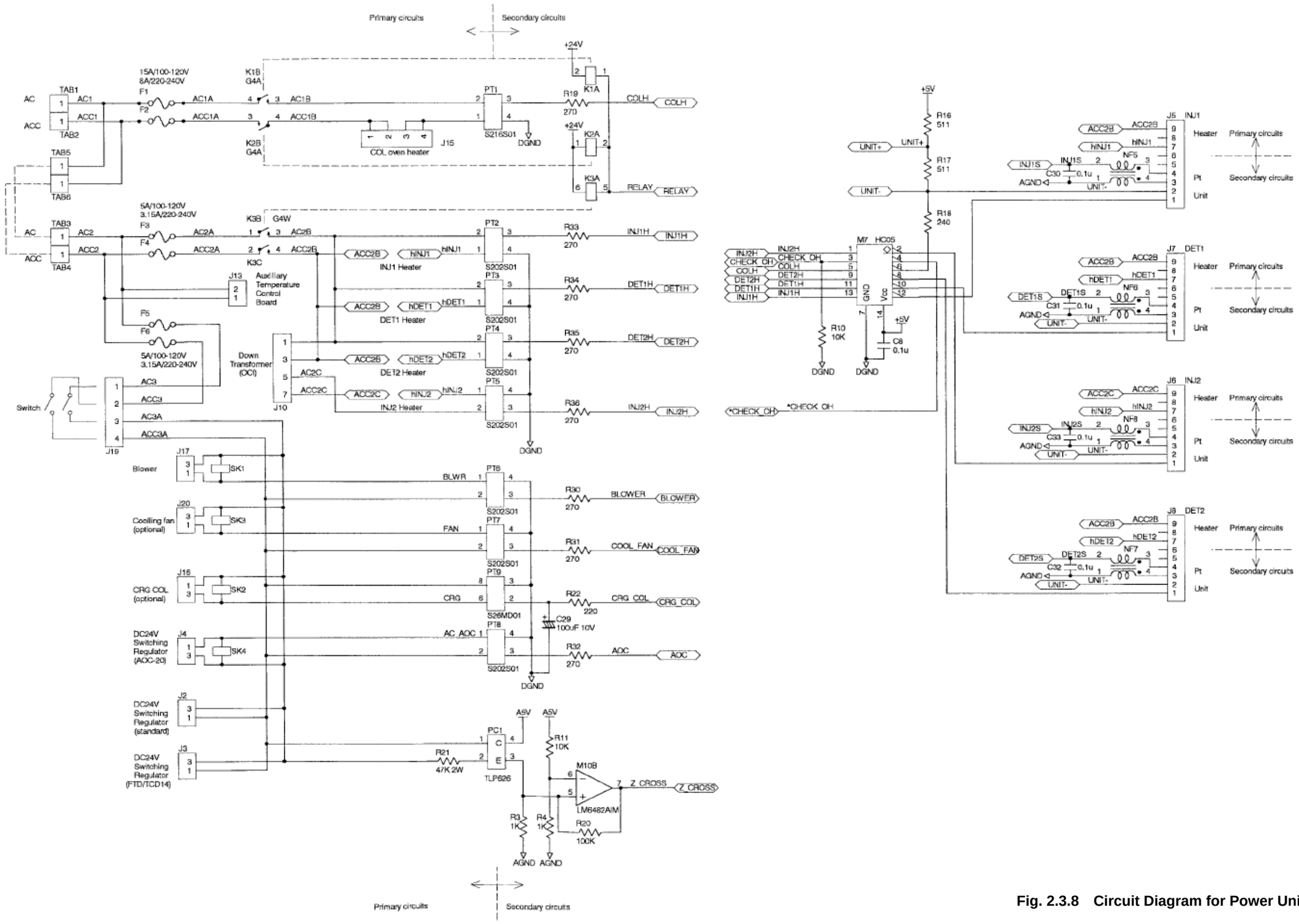


Fig. 2.3.8 Circuit Diagram for Power Unit (1/3)

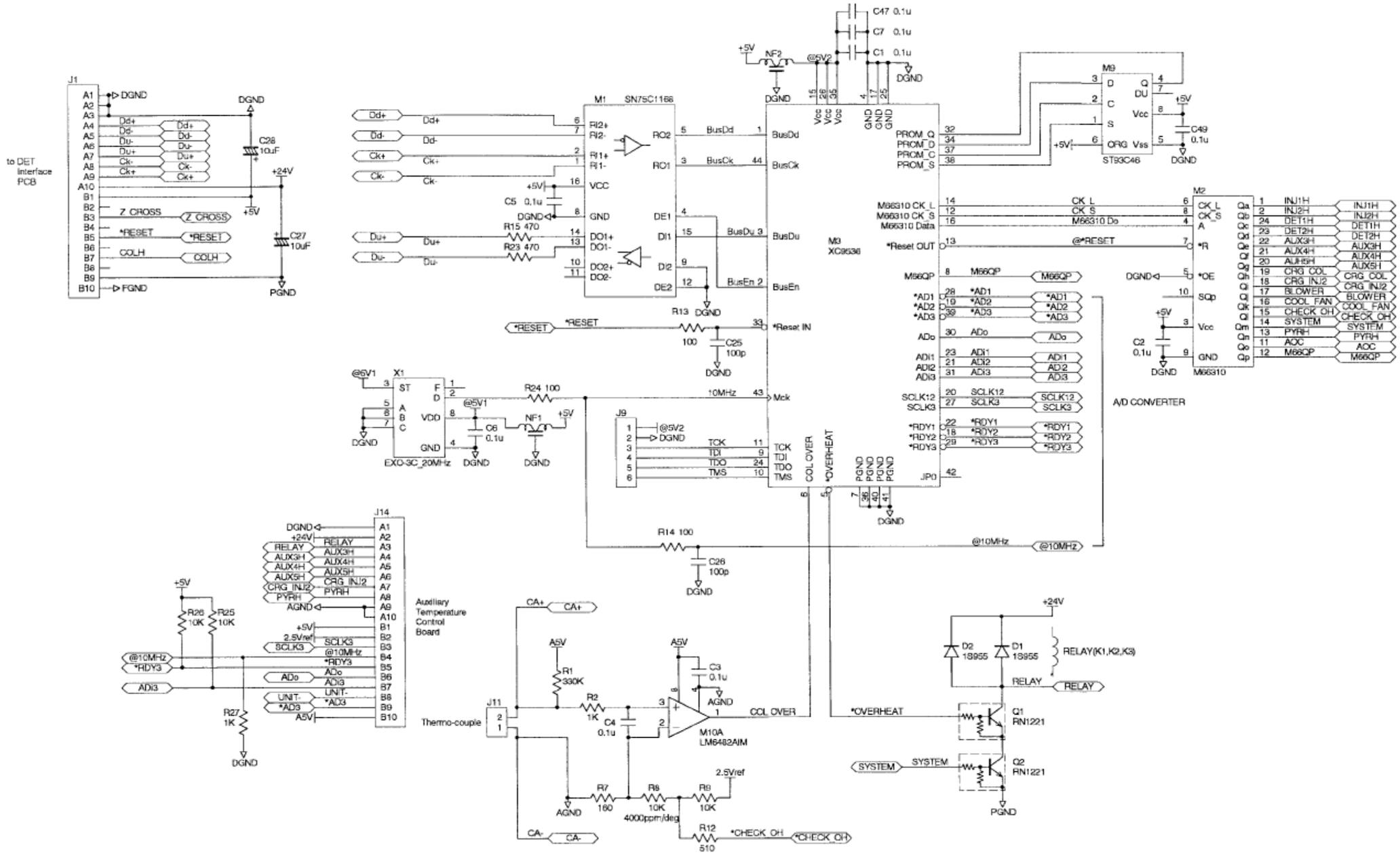


Fig. 2.3.9 Circuit Diagram for Power Unit (2/3)

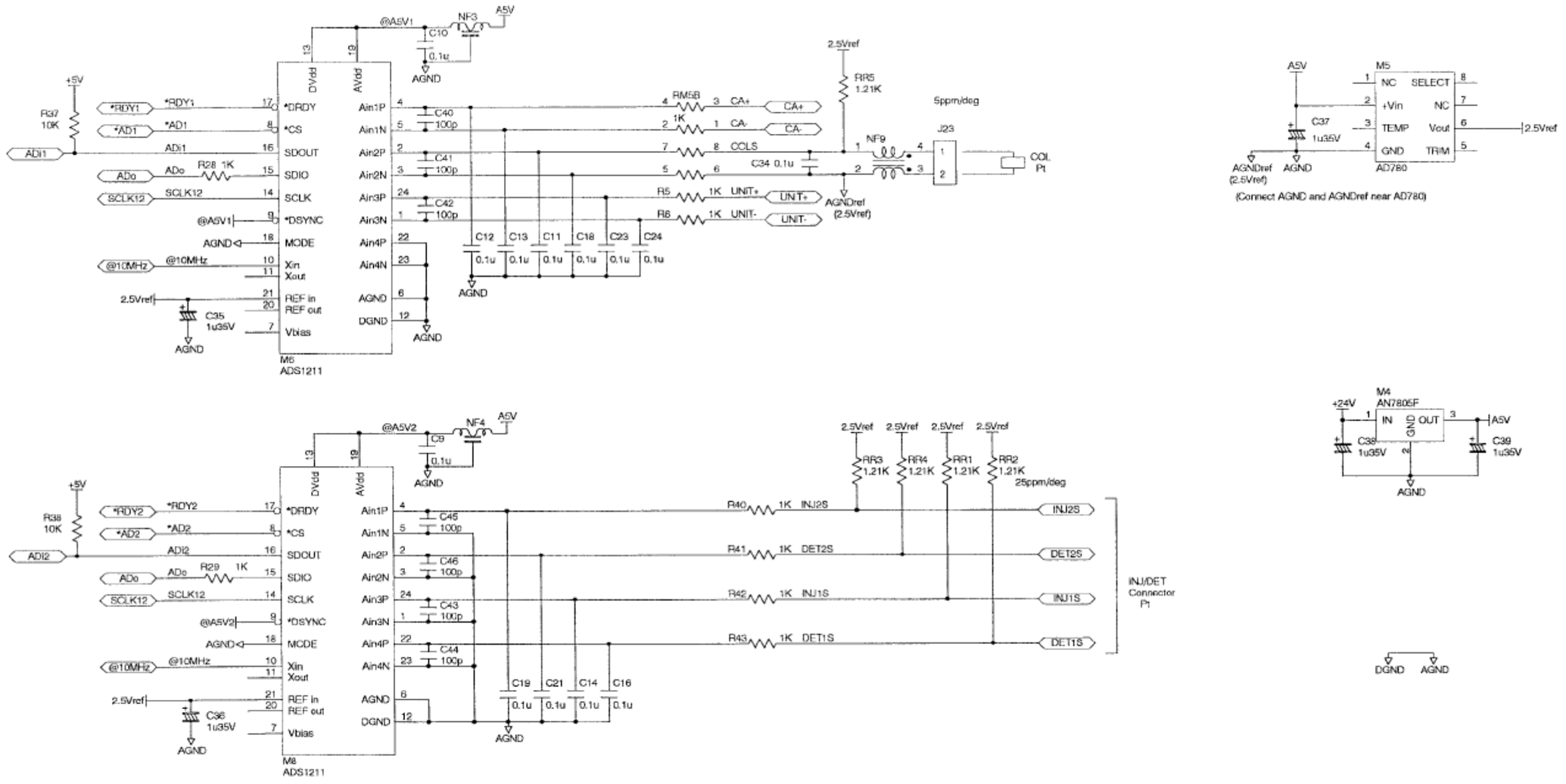


Fig. 2.3.10 Circuit Diagram for Power Unit (3/3)

2.3.4 TCD Controller

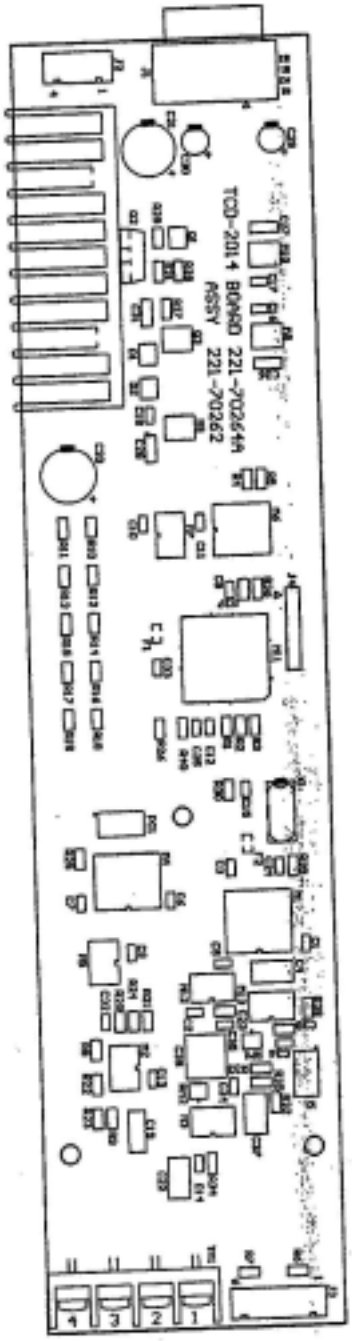


Fig. 2.3.11 Assembly Diagram for TCD Controller

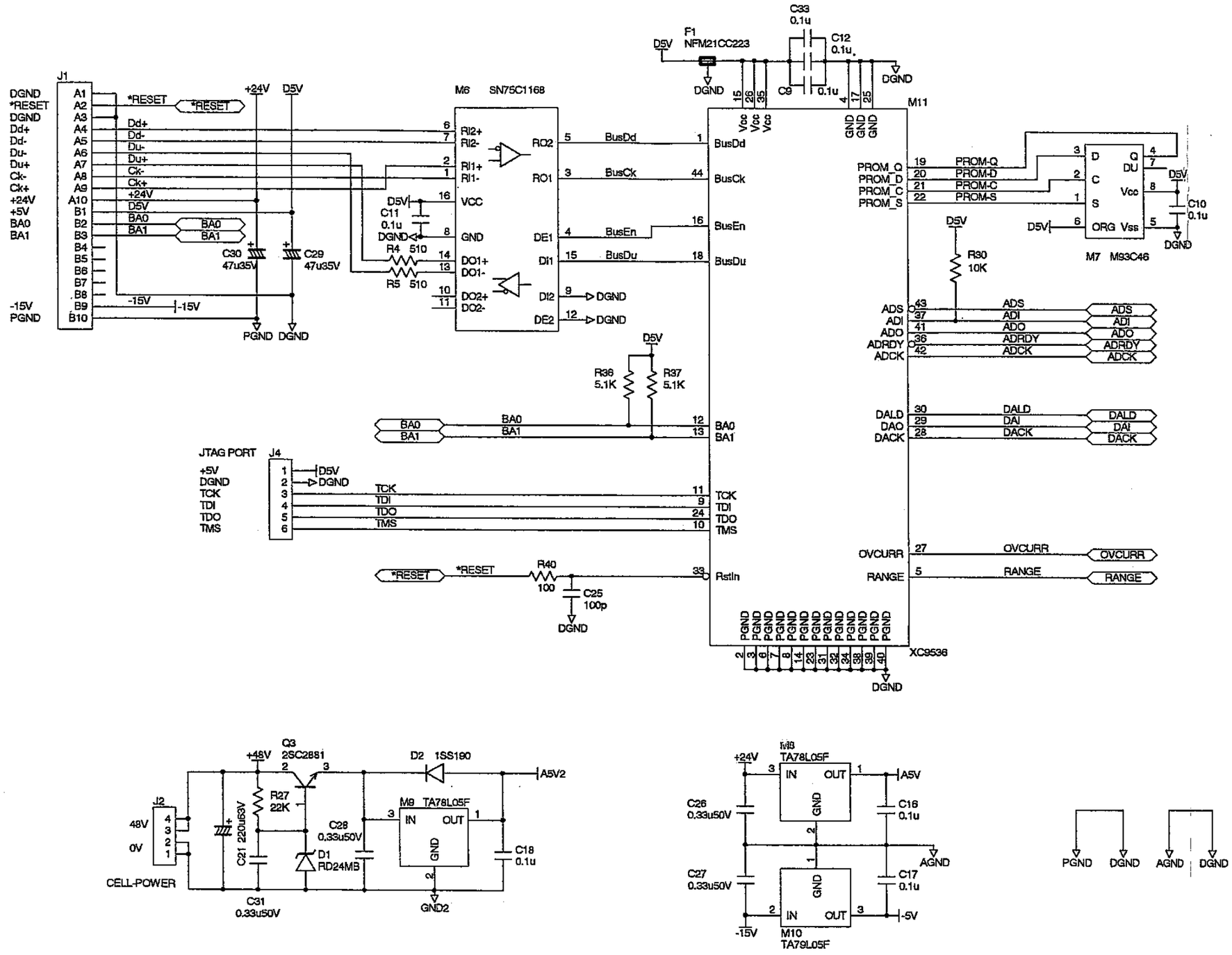


Fig. 2.3.12 Circuit Diagram for TCD Controller (1/2)

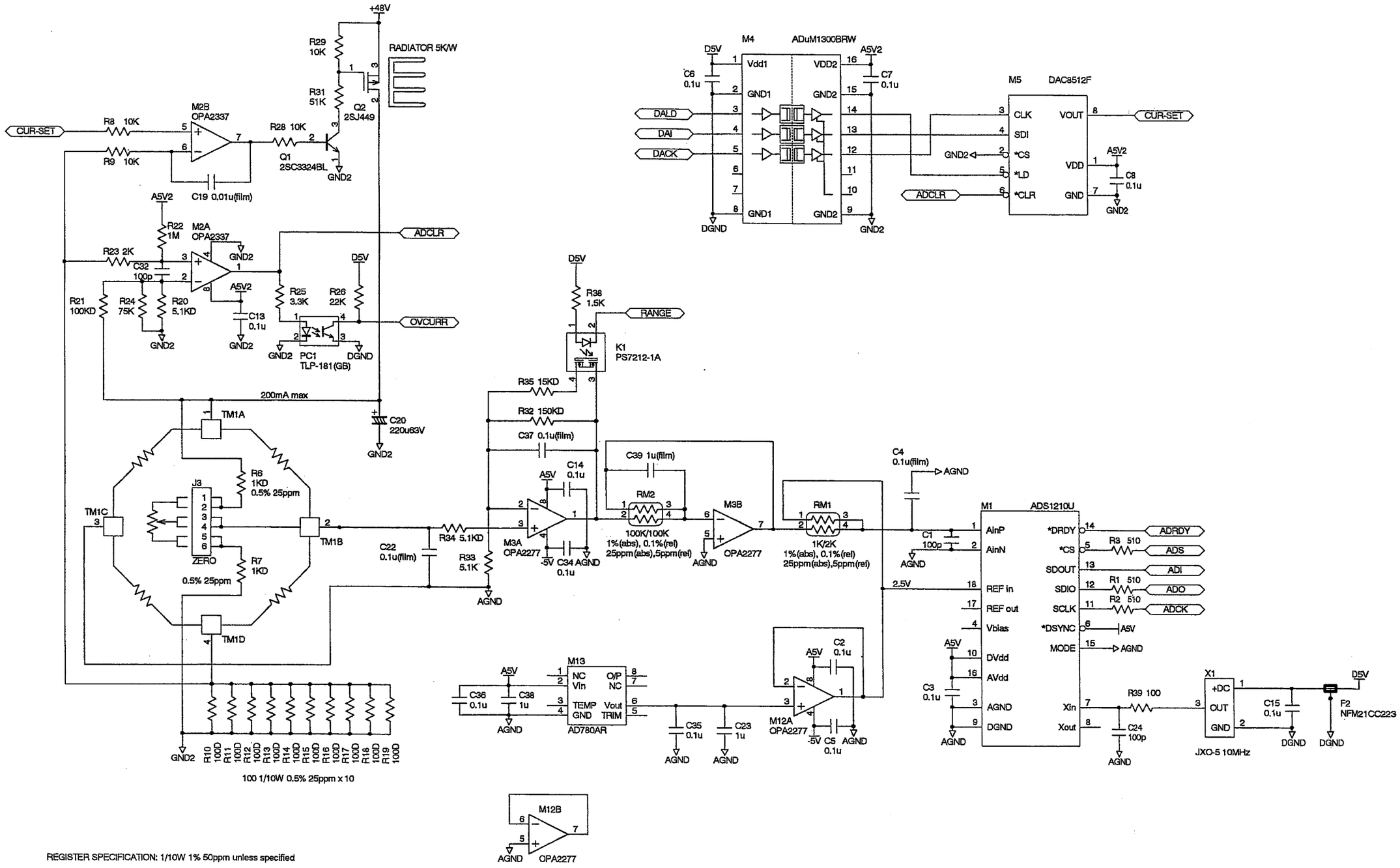


Fig. 2.3.13 Circuit Diagram for TCD Controller (2/2)

2.3.5 FID Controller

(1) AFSC, FTD, or Additional FID

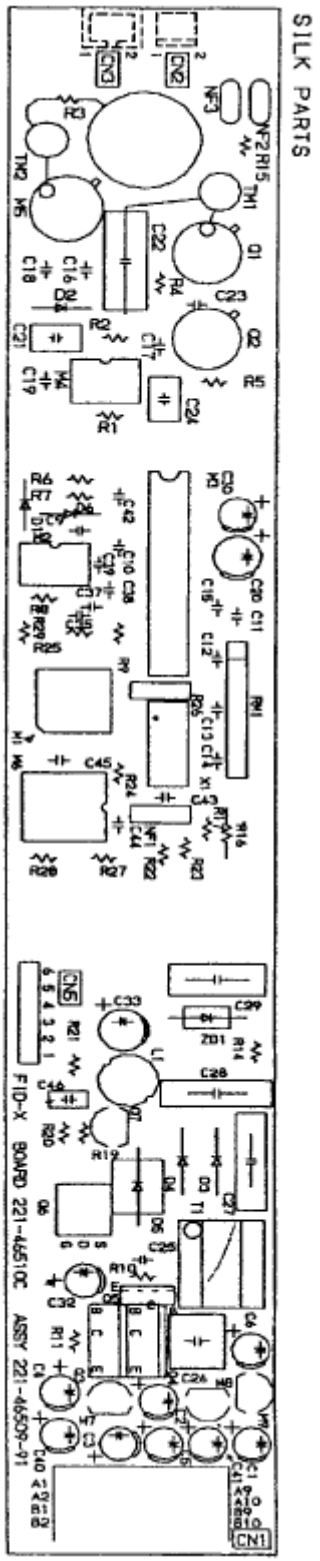


Fig. 2.3.14 Assembly Diagram for Single FID Controller

(2) AF, ATF, AF/SPL, or ATF/SPL

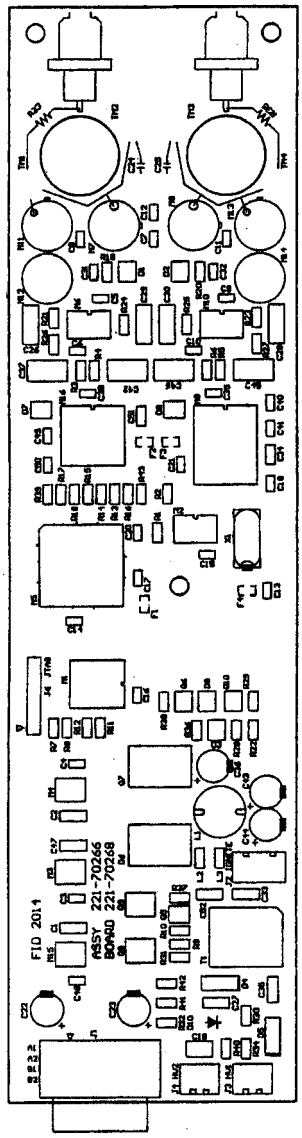


Fig. 2.3.15 Assembly Diagram of Dual FID Controller

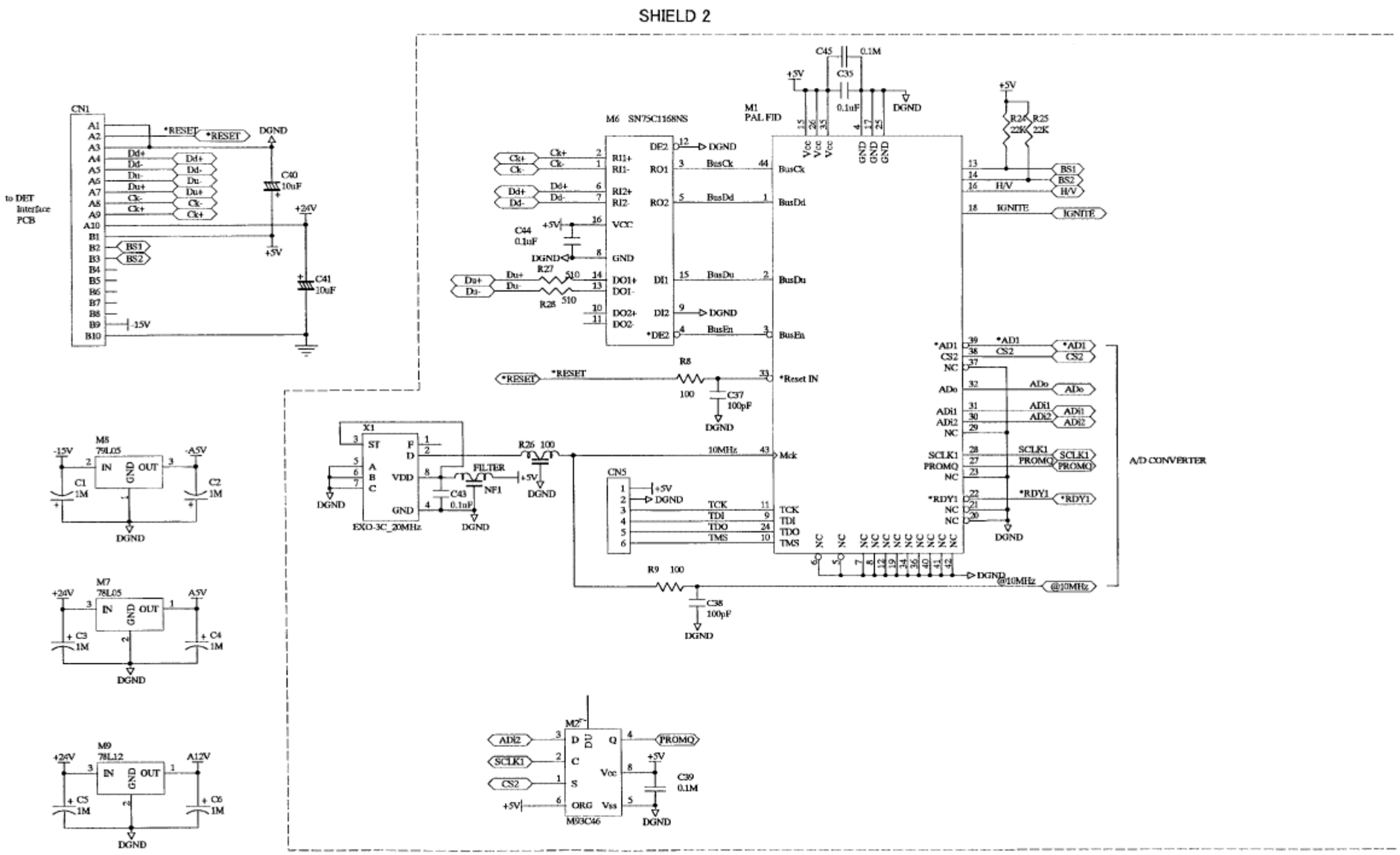


Fig. 2.3.16 Circuit Diagram for Single FID Controller (1/2)

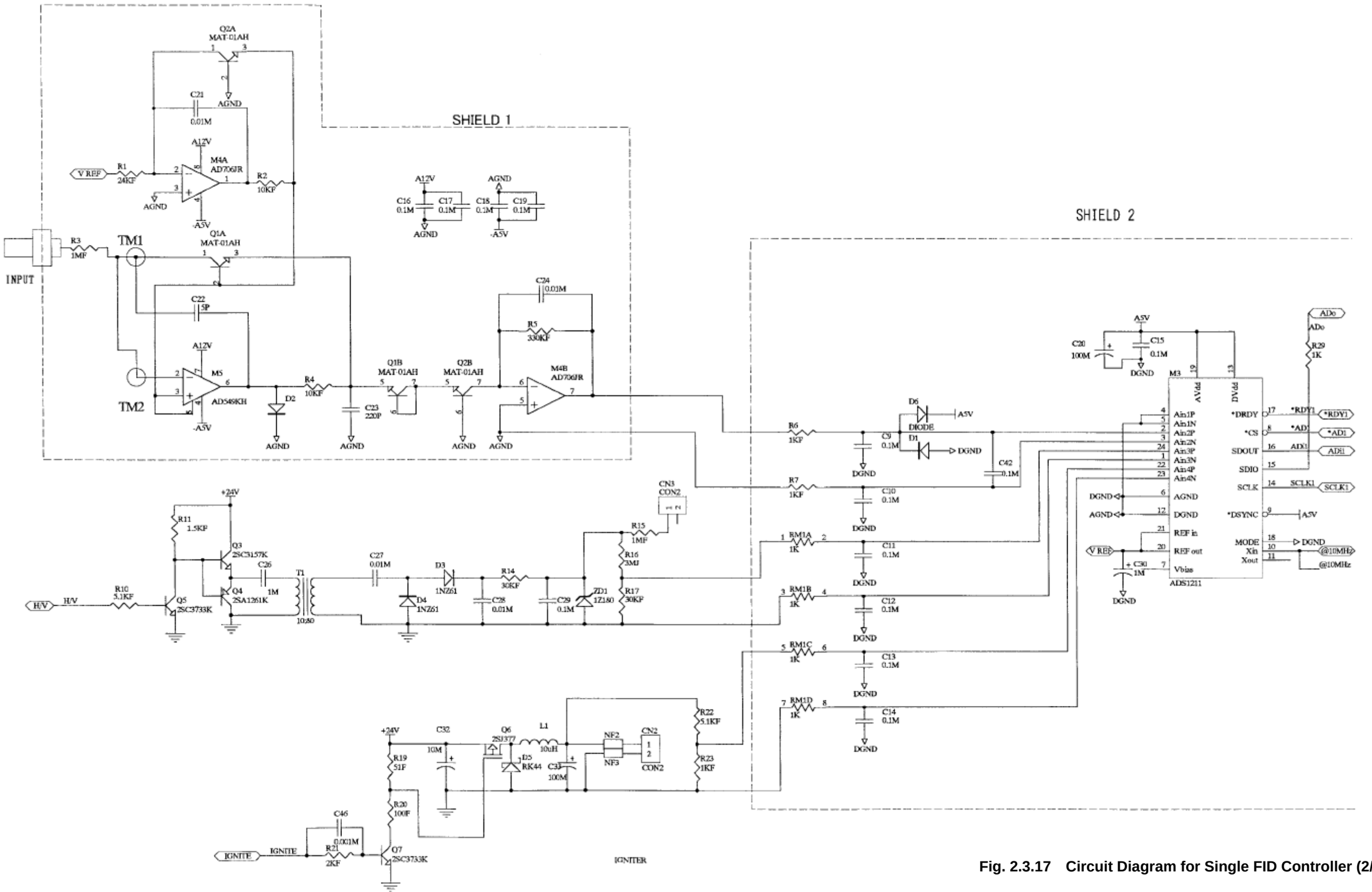


Fig. 2.3.17 Circuit Diagram for Single FID Controller (2/2)

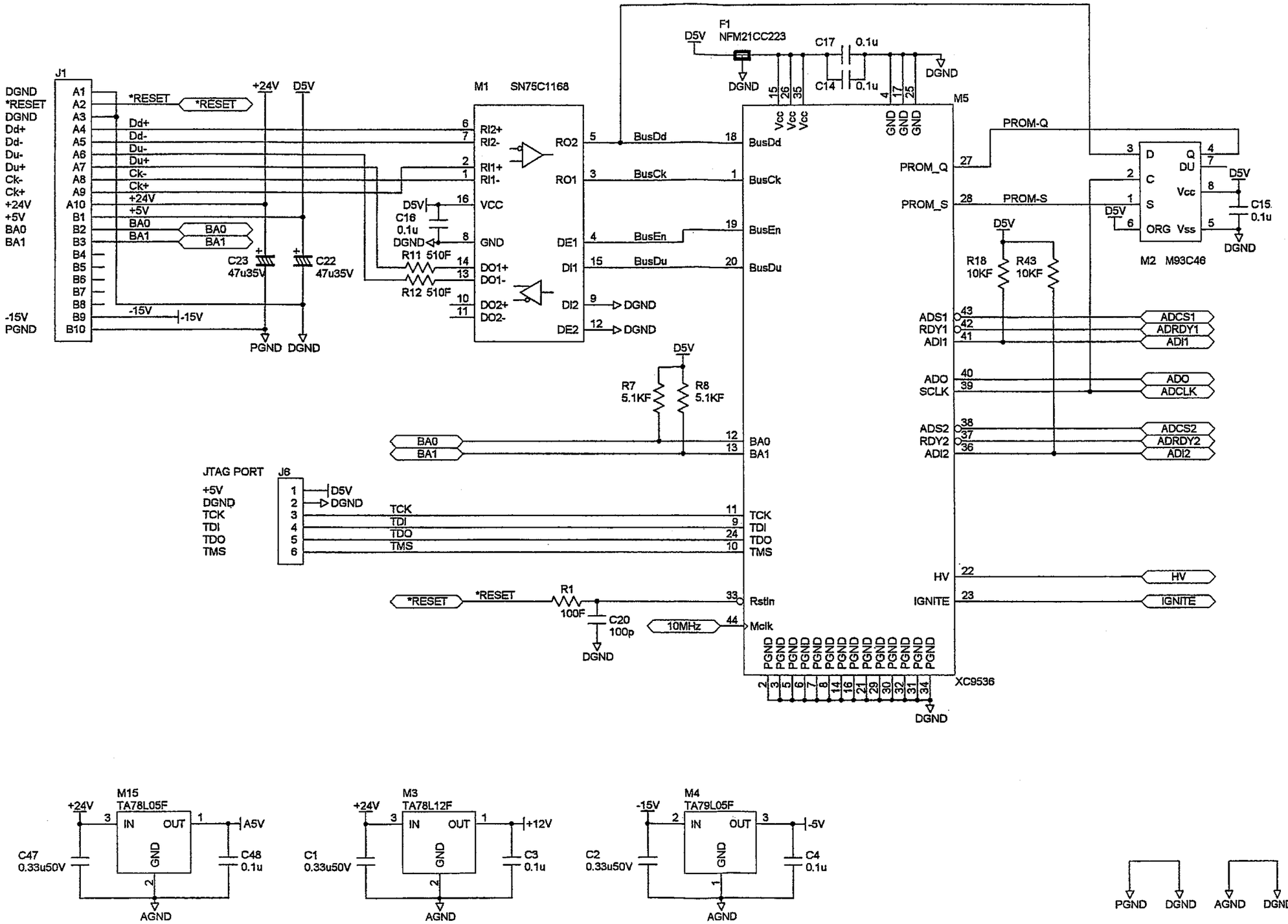


Fig. 2.3.18 Circuit Diagram for Dual FID Controller (1/3)

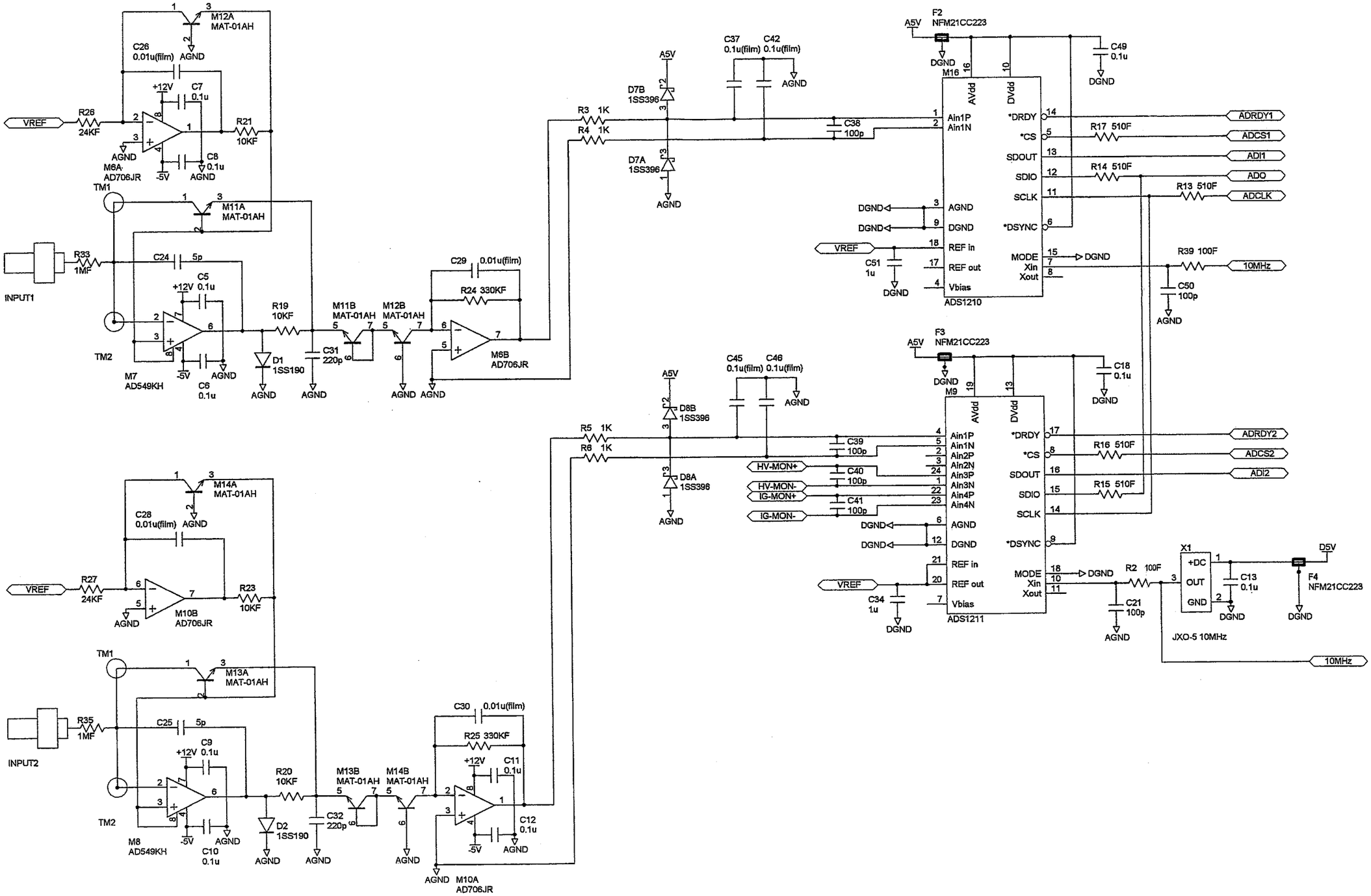
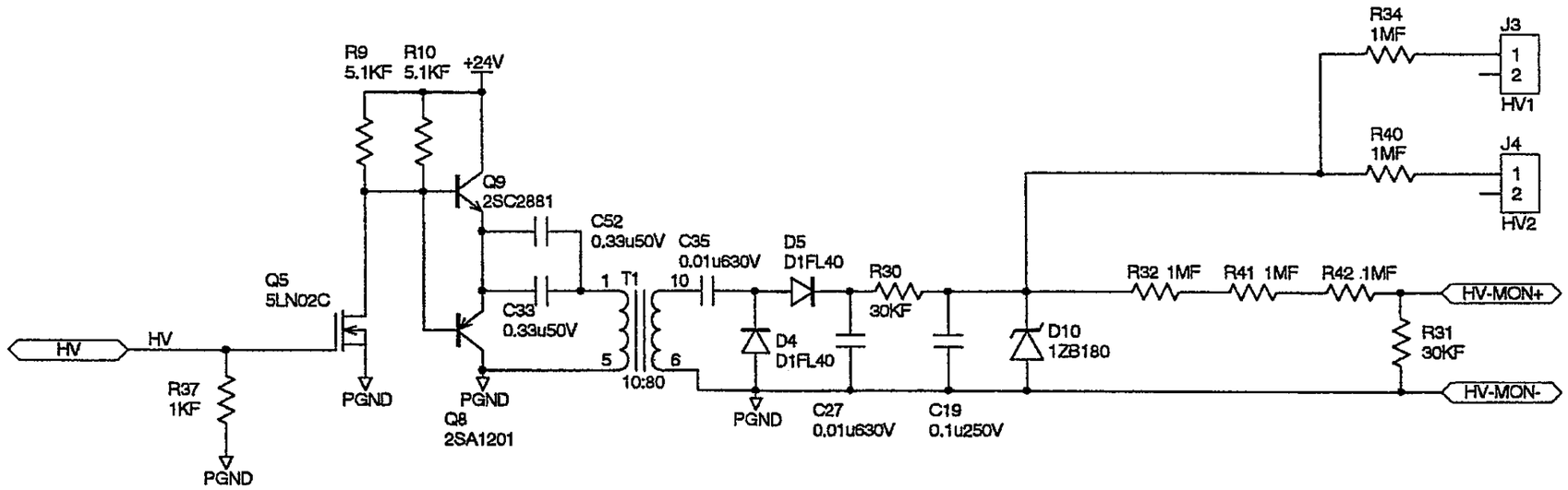


Fig. 2.3.19 Circuit Diagram for Dual FID Controller (2/3)



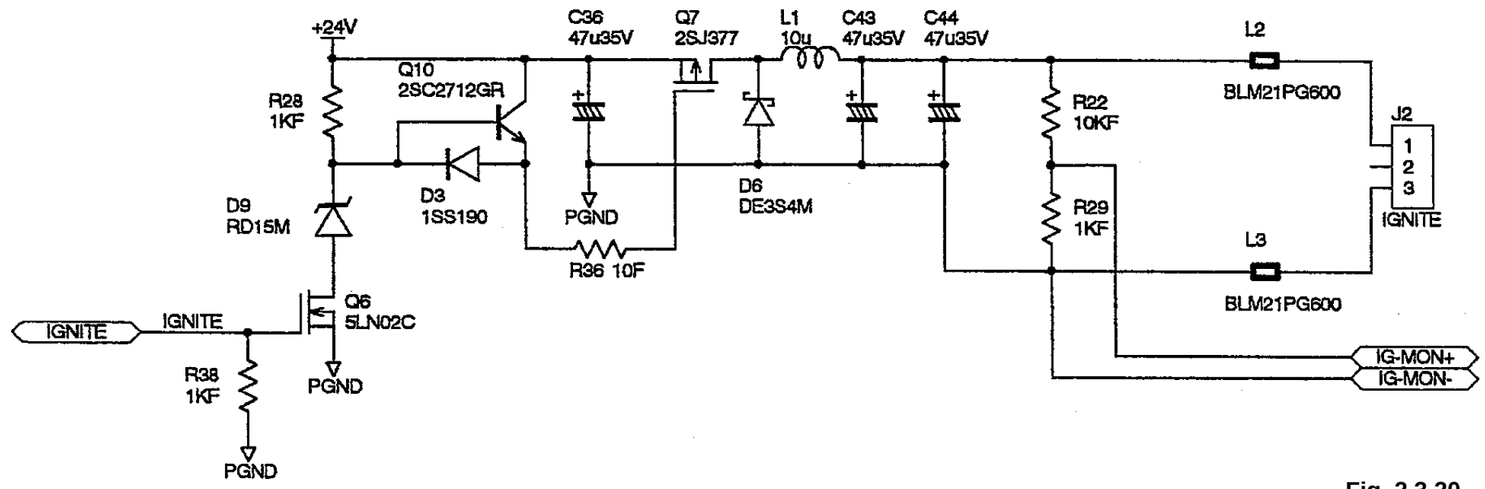


Fig. 2.3.20 Circuit Diagram for Dual FID Controller (3/3)

2.3.6 ECD Controller

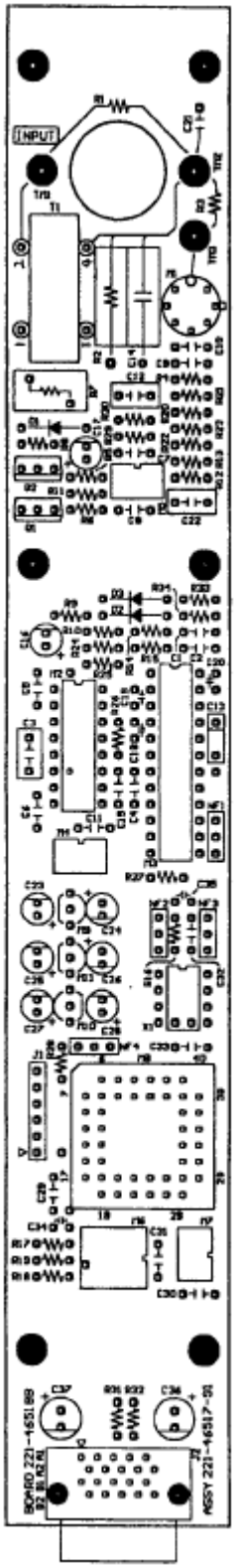


Fig. 2.3.21 Assembly Diagram for ECD Controller

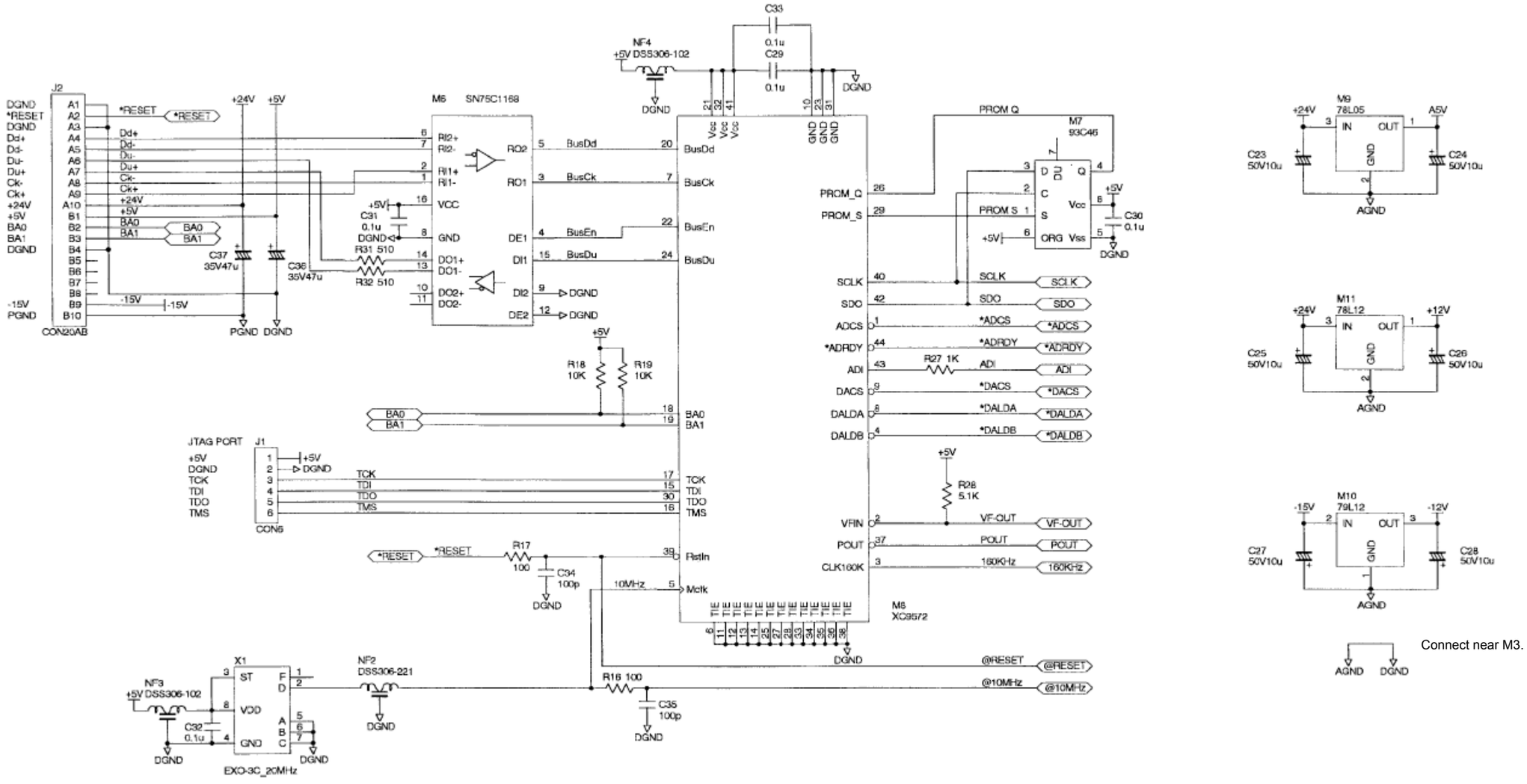


Fig. 2.3.22 Circuit Diagram for ECD Controller (1/2)

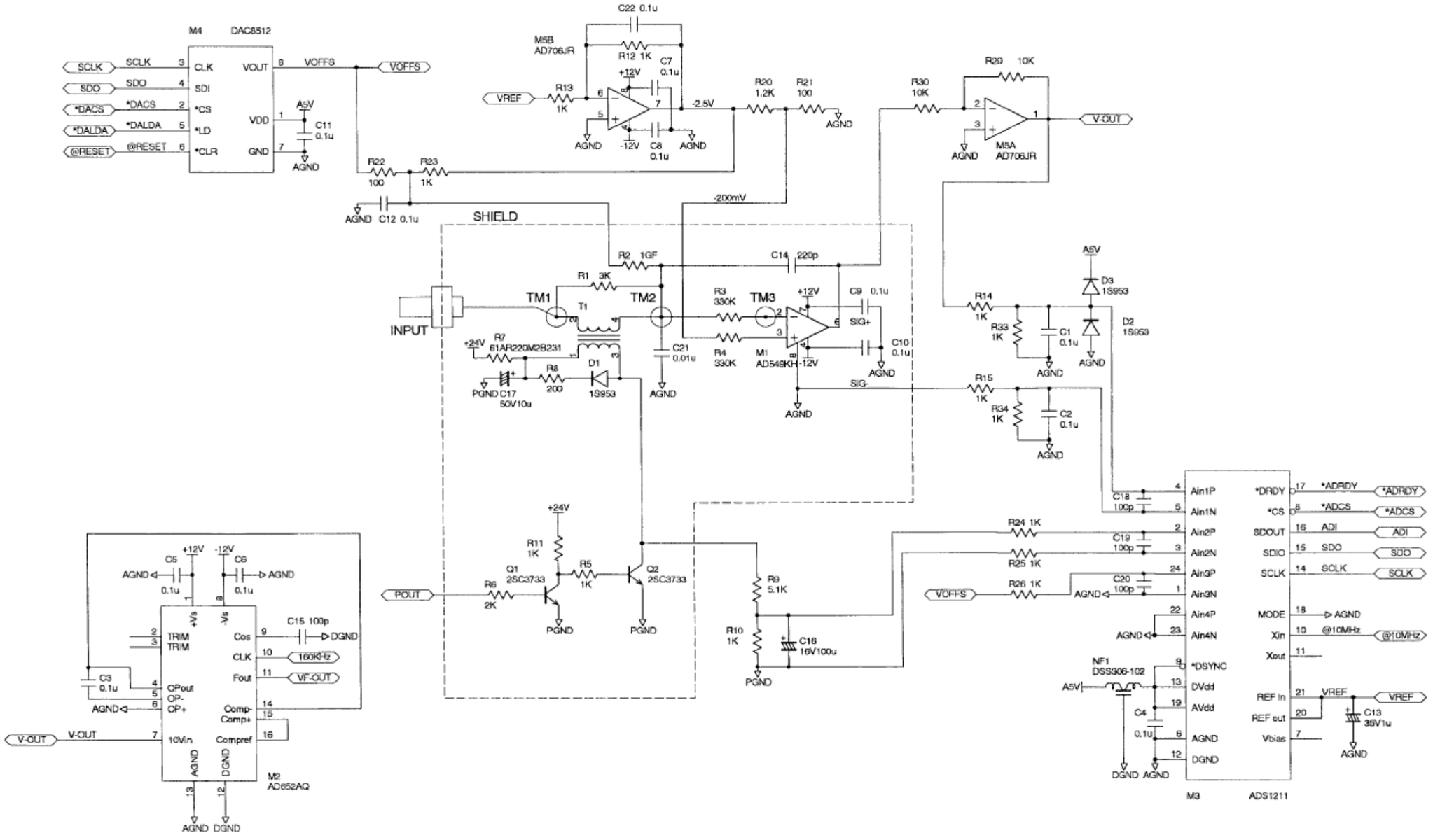


Fig. 2.3.23 Circuit Diagram for ECD Controller (2/2)

2.3.7 FPD Controller

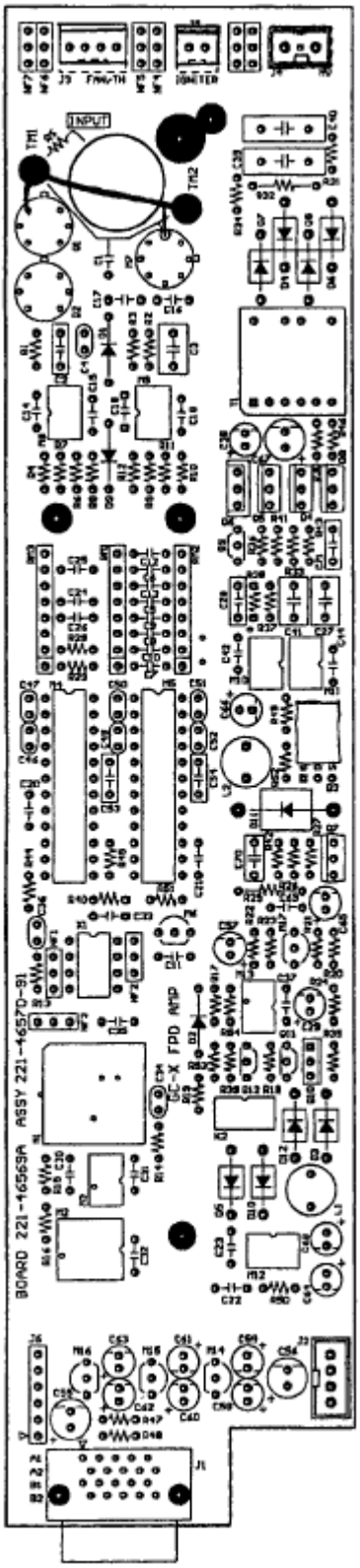


Fig. 2.3.24 Assembly Diagram for FPD Controller

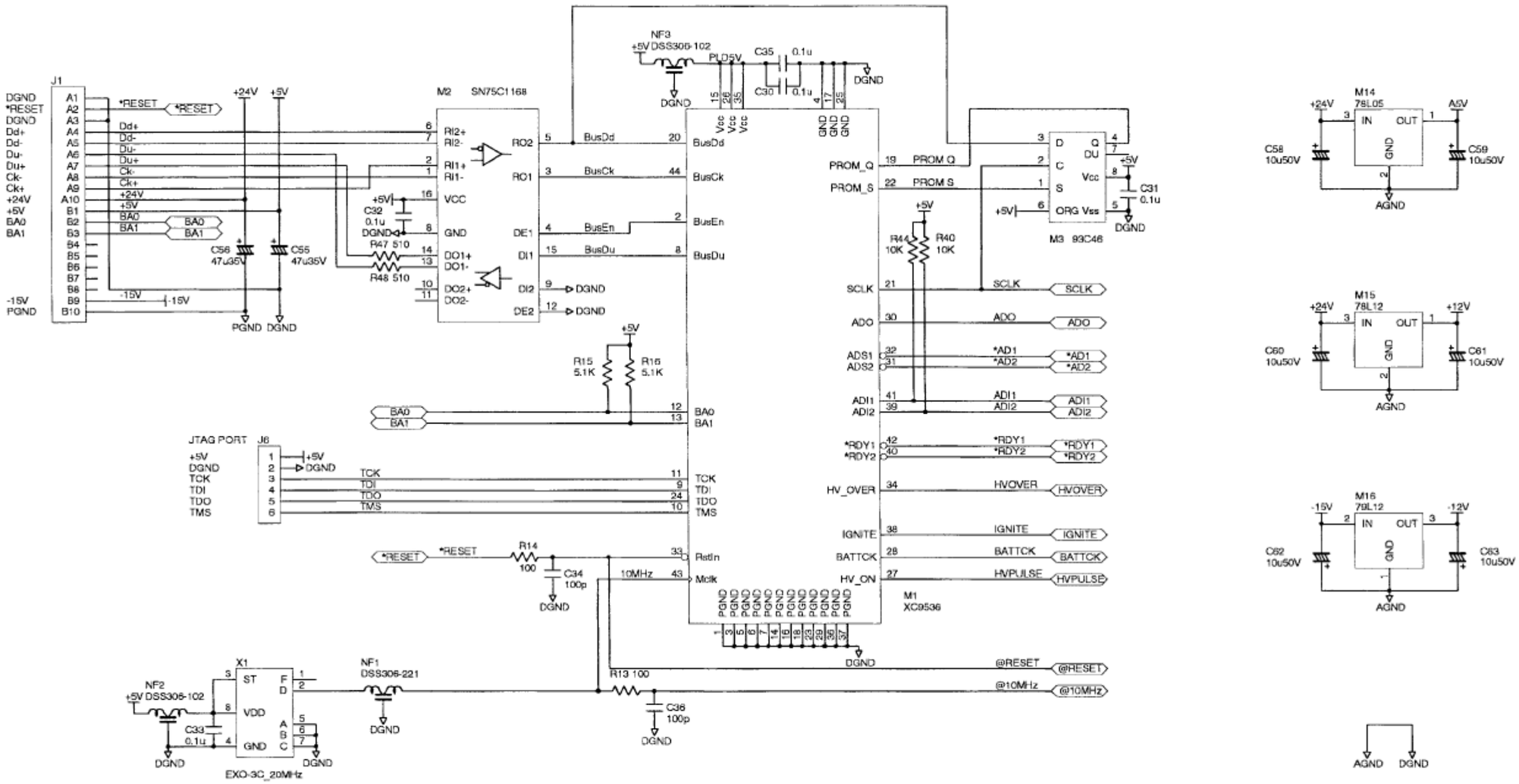


Fig. 2.3.25 Circuit Diagram for FPD Controller (1/3)

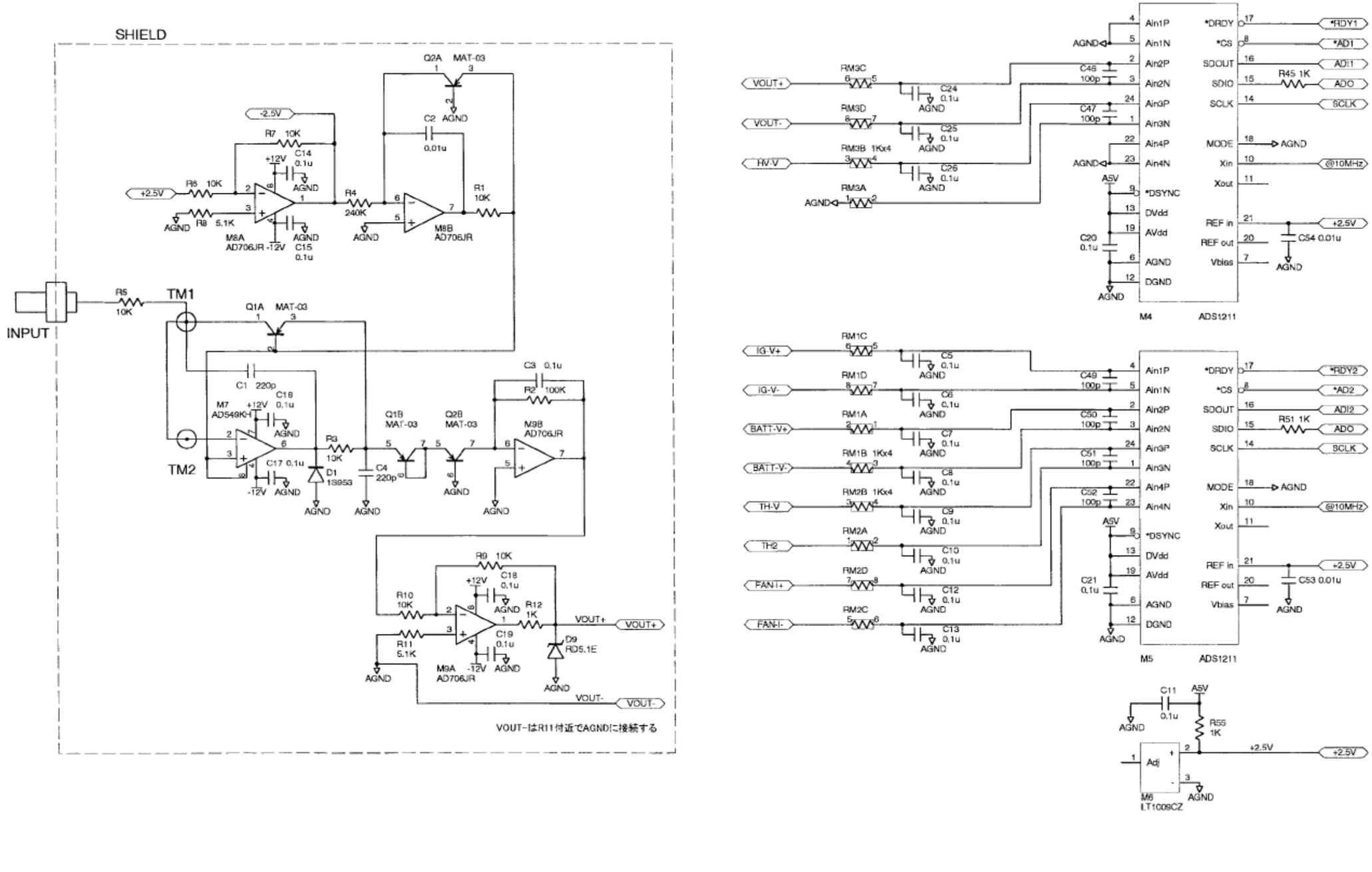


Fig. 2.3.26 Circuit Diagram for FPD Controller (2/3)

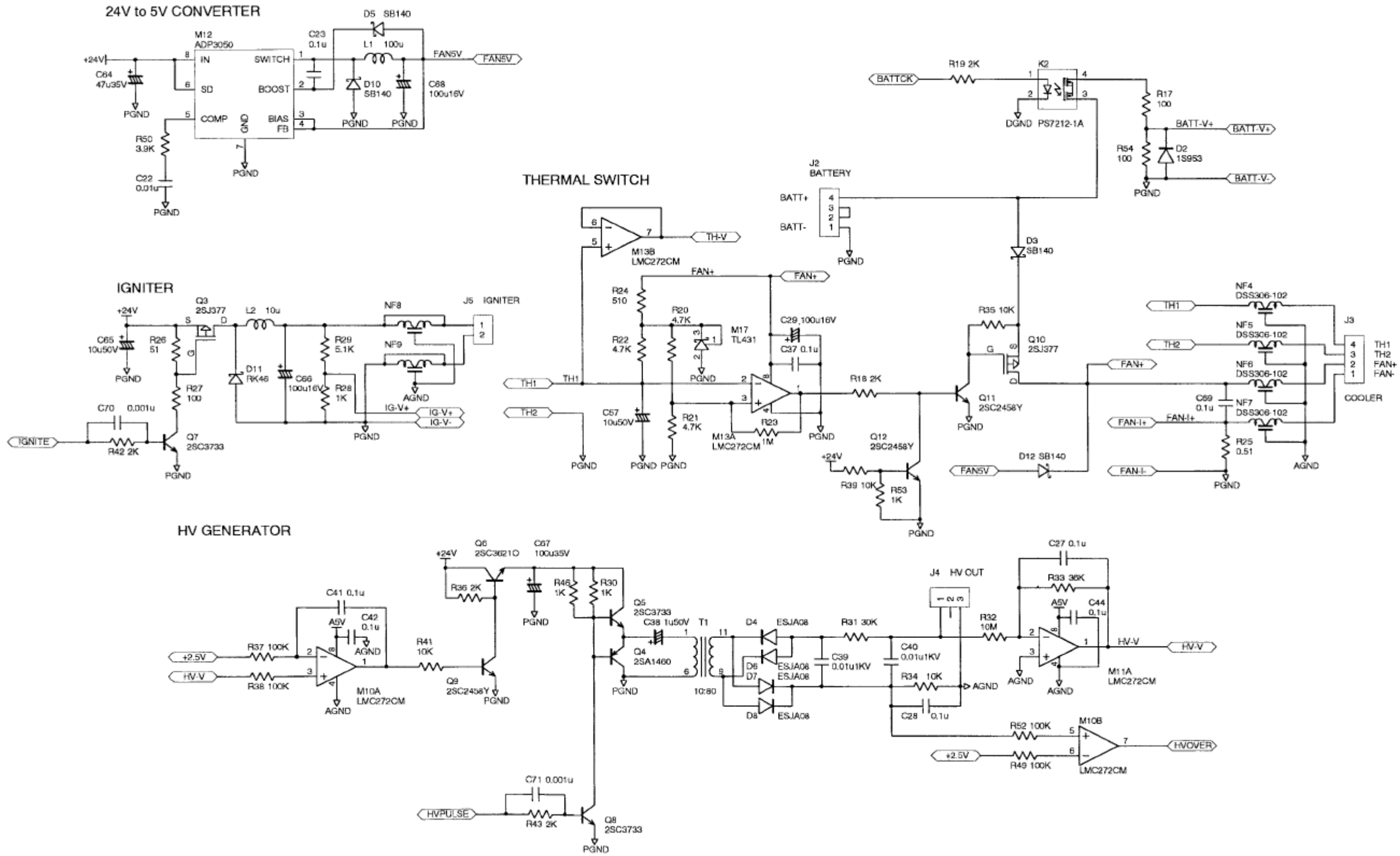


Fig. 2.3.27 Circuit Diagram for FPD Controller (3/3)

2.3.8 FTD Power Controller

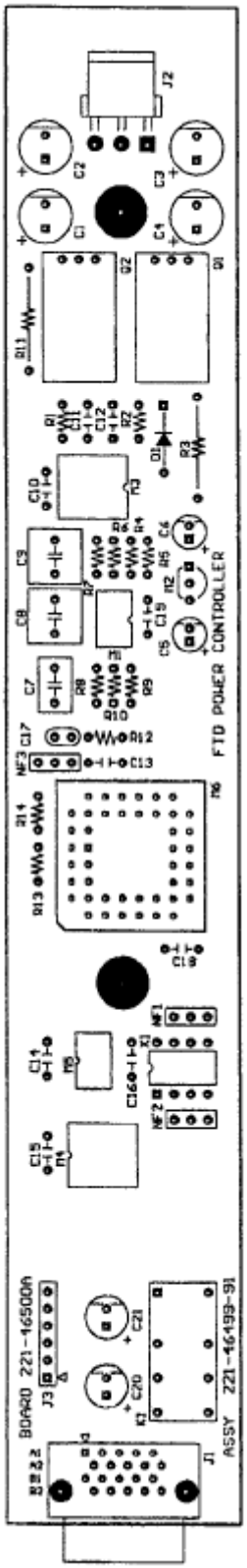


Fig. 2.3.28 Assembly Diagram for FTD Power Controller

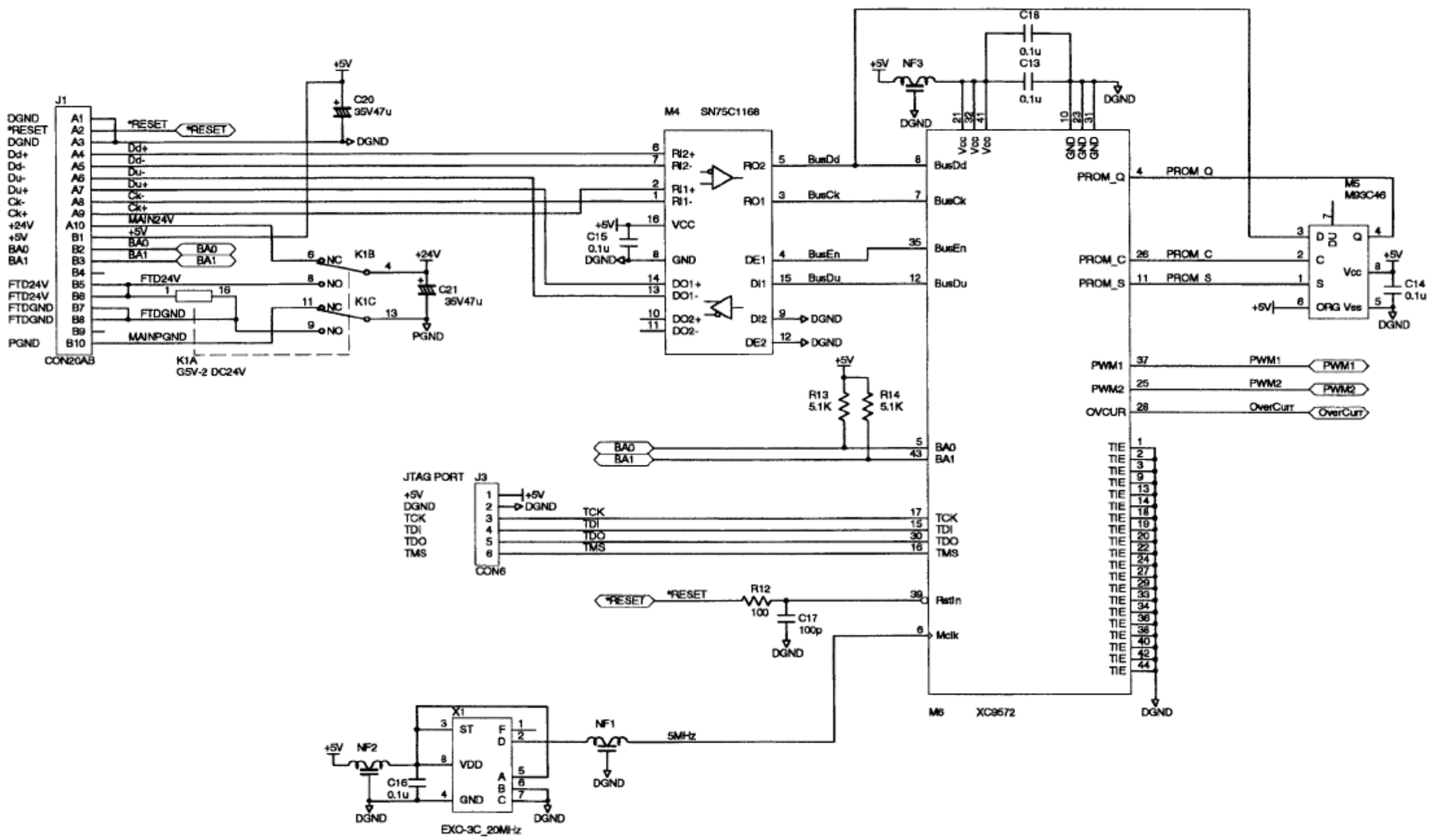
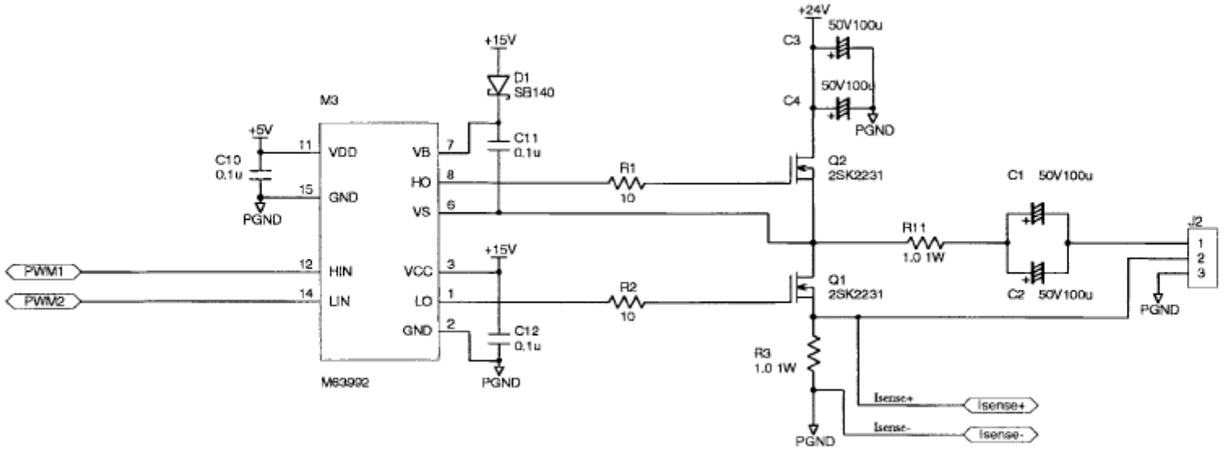
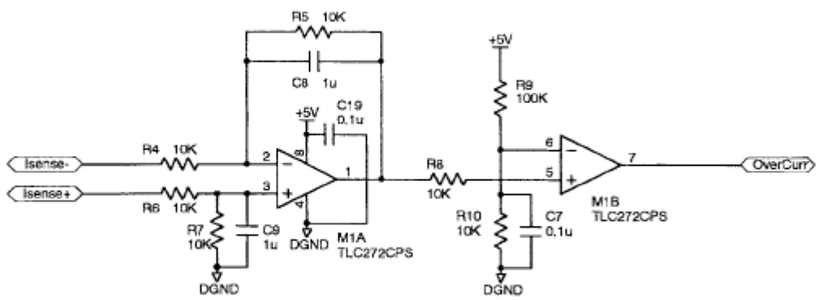


Fig. 2.3.29 Circuit Diagram for FTD Power Controller (1/2)





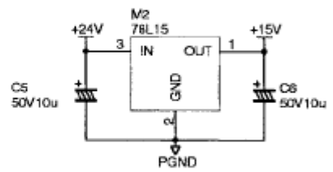


Fig. 2.3.30 Circuit Diagram for FTD Power Controller (2/2)

2.3.9 PCB AUX TEMP

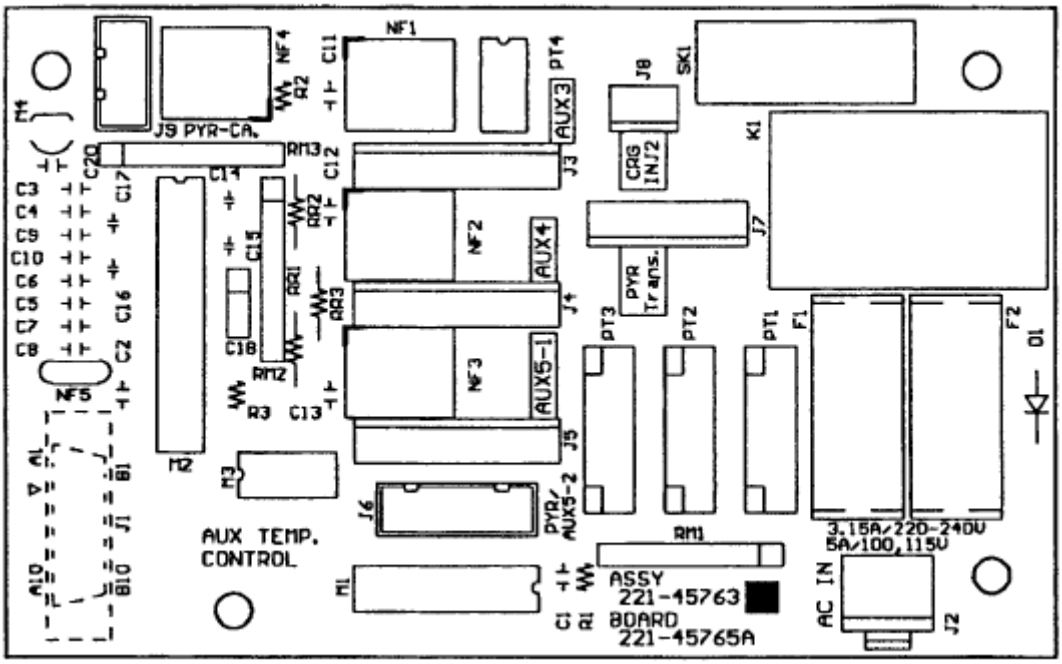


Fig. 2.3.31 Assembly Diagram for PCB AUX TEMP

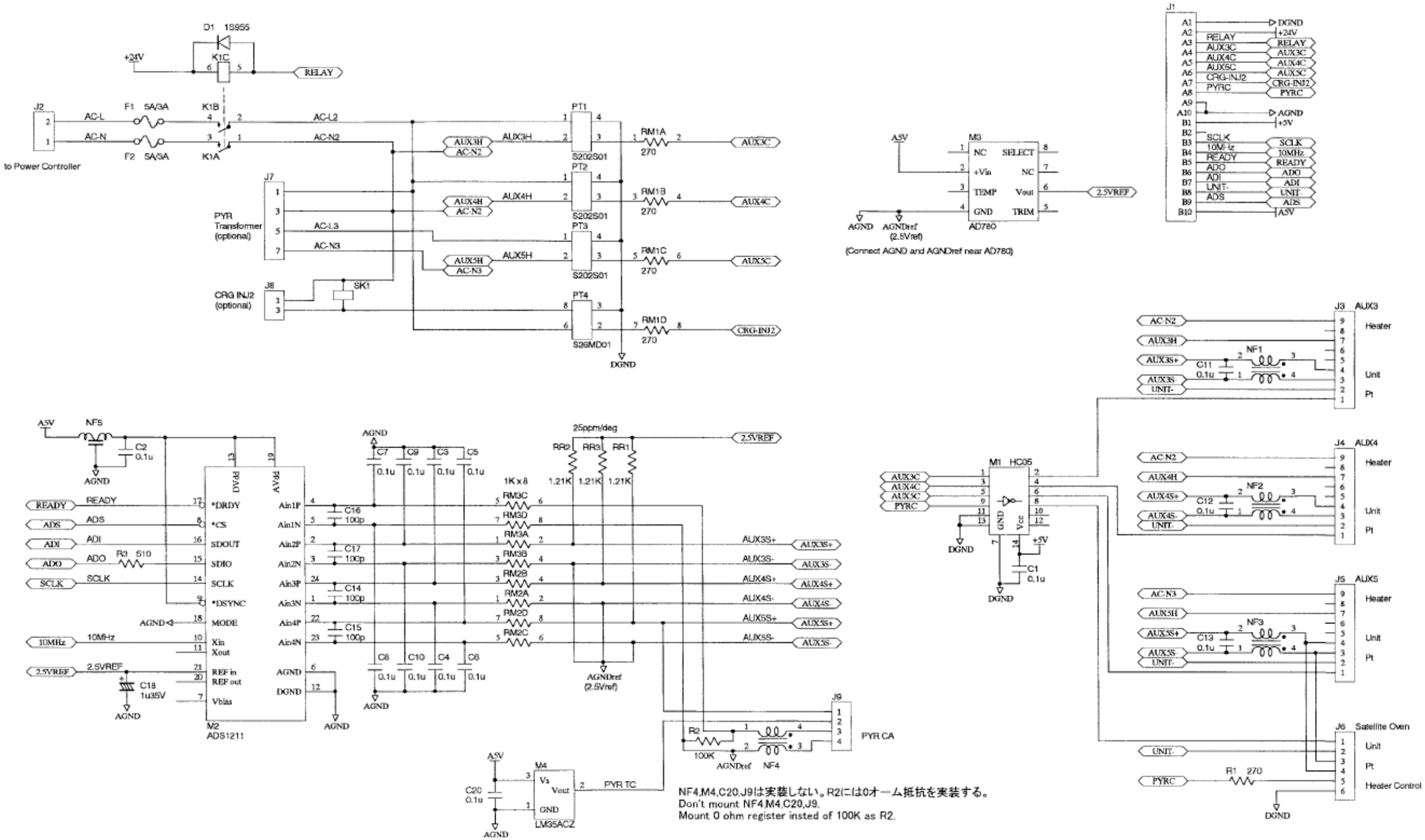


Fig. 2.3.32 Circuit Diagram for PCB AUX TEMP

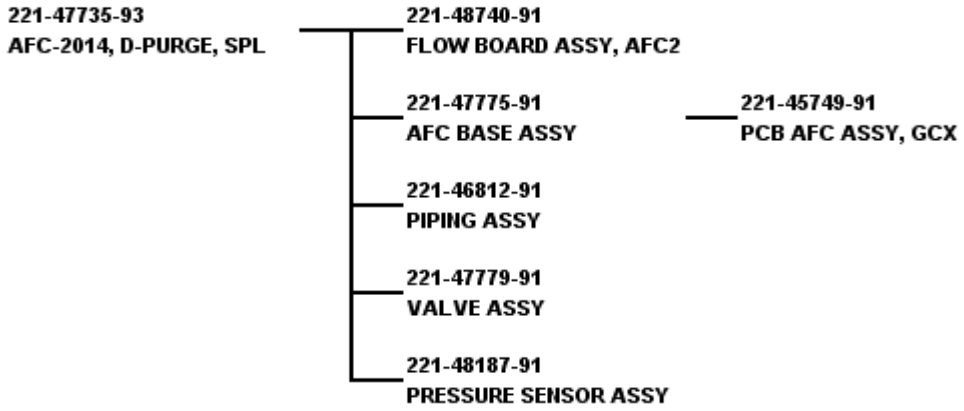
Chapter 3 Gas-Flow Controller

3.1 Configuration Diagrams for Gas-Flow Controller

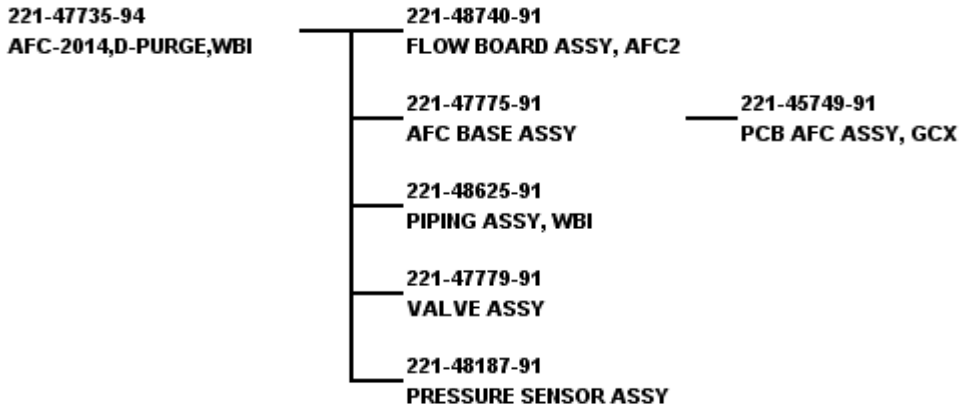
3.1.1 AFC

There are four types of AFC: for packed dual injection, split/splitless injection, WBI (direct), and packed single injection.

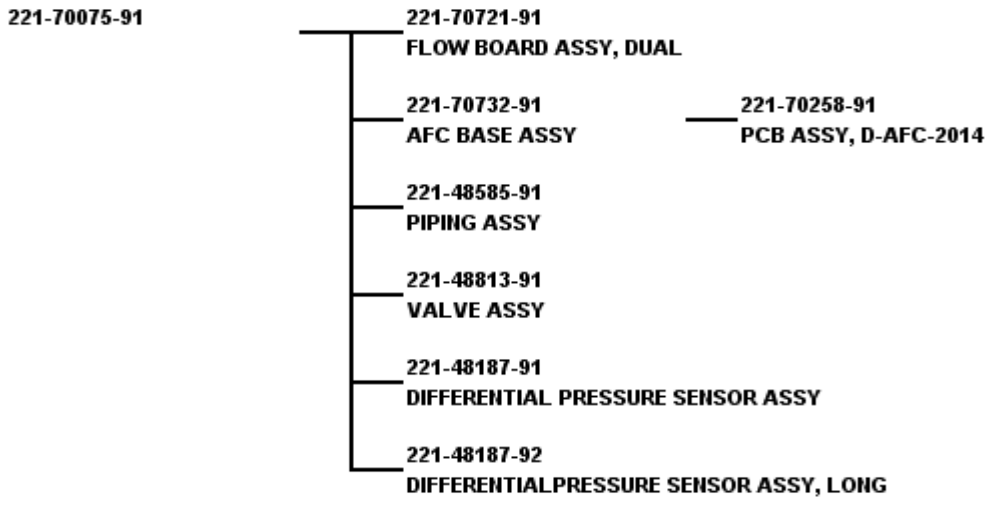
AFC_SPL (Assembly Configuration Chart)

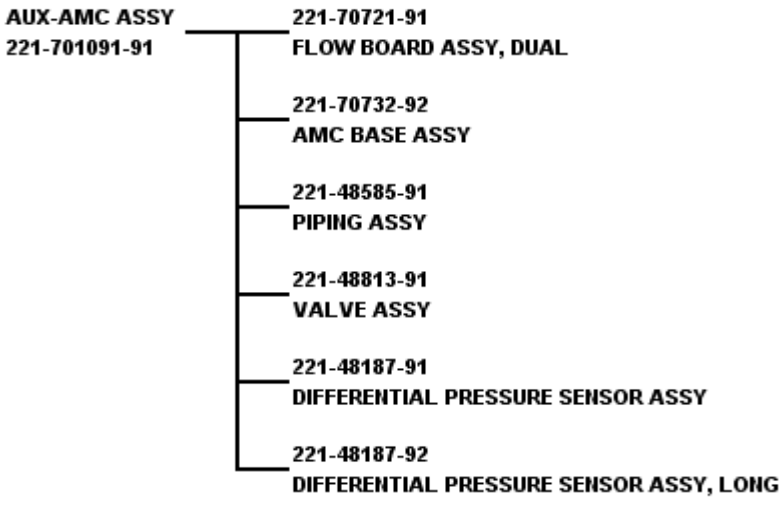


AFC_WBI (Assembly Configuration Chart)



DAFC (Assembly Configuration Chart)




AUX-AMC ASSY
221-701091-91
221-70721-91
FLOW BOARD ASSY, DUAL
221-70732-92
AMC BASE ASSY
221-48585-91
PIPING ASSY
221-48813-91
VALVE ASSY
221-48187-91
DIFFERENTIAL PRESSURE SENSOR ASSY
221-48187-92
DIFFERENTIAL PRESSURE SENSOR ASSY, LONG

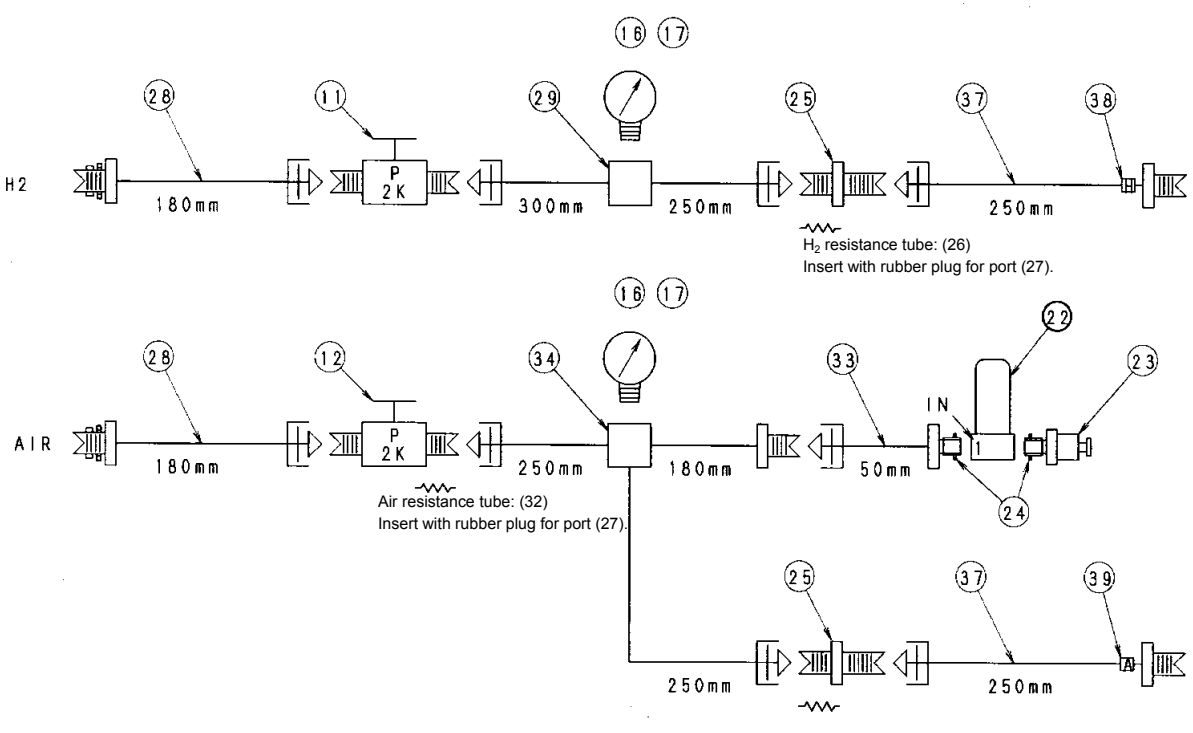
3.1.2 Manual Flow Controller

3.1.2.1 FID

221-70049-91
FLOW CONTROLLER, H2-AIR,FID

Reference No.		
11	1PC,	221-18150-91 N BELLOW VALVE, 2K
12	1PC,	221-41511-91 N BELLOW VALVE, 2K, WITH RESISTANCE
16	2PC,	670-18558-11 PRESSURE GAUGE, 200 KPA
17		018-21330 TAPE, STICKER, 0.1 × 13 × 5
22	1PC,	221-70483-91 SOLENOID VALVE ASSY
23	1PC,	042-40043-02 SPEED CONTROLLER, ASN2-M5
24	2PC,	035-60395-43 GASKET
25	2PC,	221-31745 HOUSING
26	1PC,	221-19502-08 RESISTANCE TUBE, HYDROGEN, GC-8A
27	3PC,	201-47435 RUBBER PLUG, PORT, SILICON
28	2PC,	221-09864-18 PIPE, MF-MM17, 2 × 180
29	1PC,	221-41408-94 PIPE, PG-MF-MF ASSY
32	2PC,	221-19503-08 RESISTANCE TUBE, AIR, GC-8AF
33	1PC,	221-41410-91 PIPE, M5-MF ASSY
34	1PC,	221-41527-92 PIPE, PG-MF-MF-MMASS
37	2PC,	201-48557-25 PIPE, MN2W-MM2W
38	1PC,	072-83071-08 MARK BAND H
39	1PC,	072-83071-01 MARK BAND A

FID

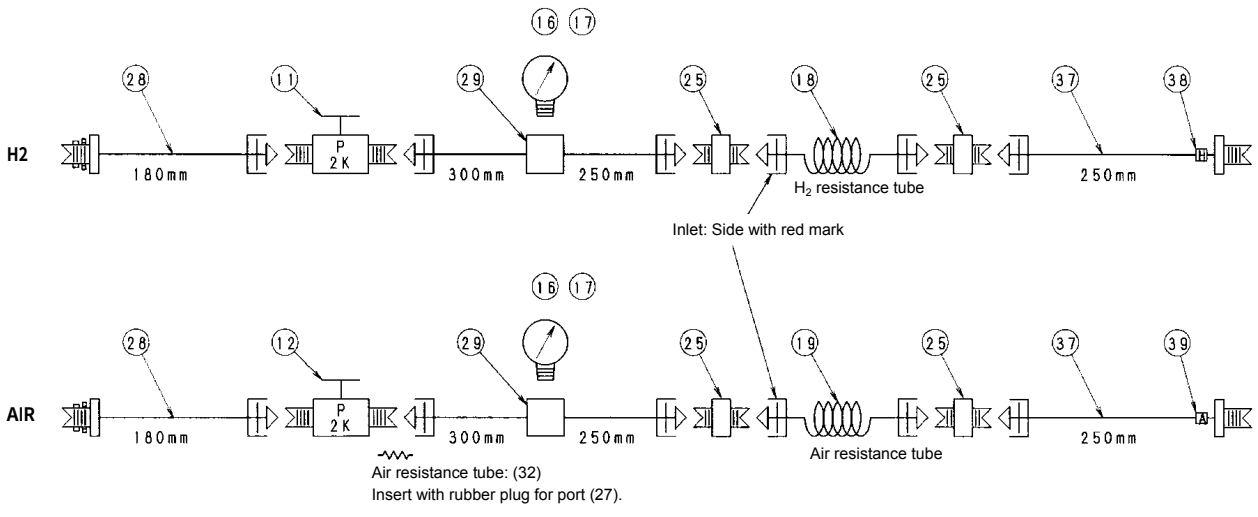

H2
AIR
16
17
28
11
29
25
37
38
12
34
33
22
23
24
39
P
2K
180mm
300mm
250mm
50mm
IN
H2 resistance tube: (26)
Insert with rubber plug for port (27).
Air resistance tube: (32)
Insert with rubber plug for port (27).

3.1.2.2 FTD

221-70049-92
FLOW CONTROLLER, H2-AIR, FTD

Reference No.	
11	221-18150-91
1PC,	N BELLOW VALVE, 2K
12	221-41511-91
1PC,	N BELLOW VALVE, 2K, WITH RESISTANCE
16	670-18558-11
2PC,	PRESSURE GAUGE, 200 KPA
17	018-21330
	TAPE, STICKER, 0.1 × 13 × 5
18	221-18713-95
1PC,	FTD-9, RESISTANCE TUBE ASSY, H2
19	221-18713-96
1PC,	FTD-9, RESISTANCE TUBE ASSY, AIR
25	201-30219
4PC,	SOCKET
27	201-47435
1PC,	RUBBER PLUG, PORT, SILICON
28	221-09864-18
2PC,	PIPE, MF-MM17, 2 × 180
29	221-41408-94
2PC,	PIPE, PG-MF-MF ASSY
32	221-19503-08
2PC,	RESISTANCE TUBE, AIR, GC-8AF
37	201-48557-25
2PC,	PIPE, MN2W-MM2W
38	072-83071-08
1PC,	MARK BAND H
39	072-83071-01
1PC,	MARK BAND A

FTD

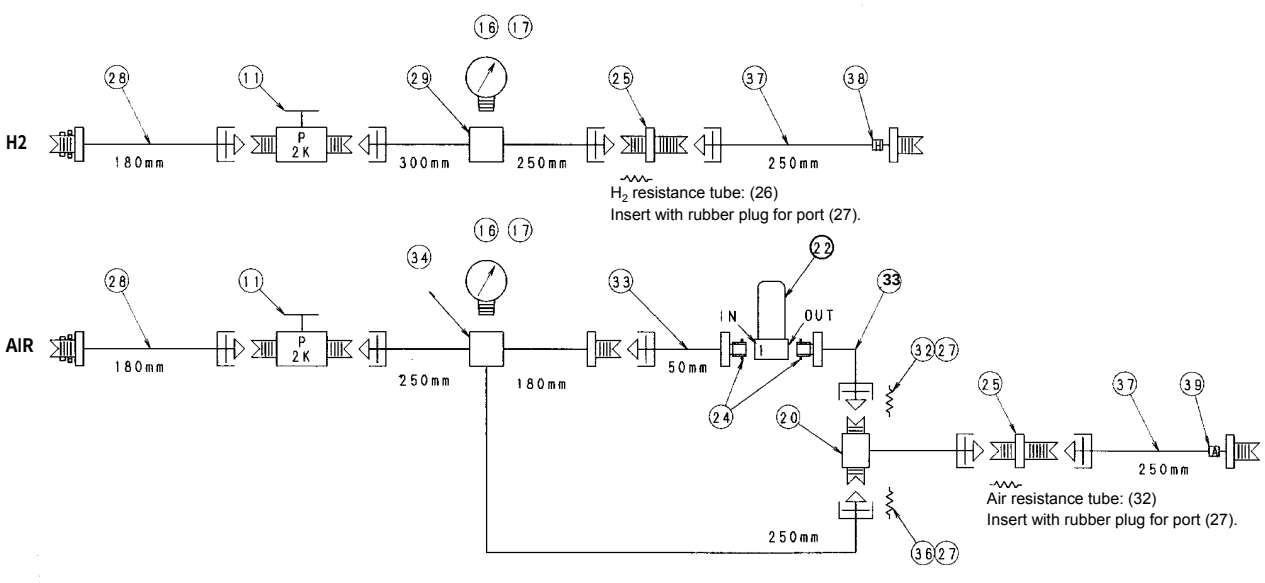

H2
16 17
28
11
29
25
18
25
37
38
P
2K
180mm
300mm
250mm
250mm
H2 resistance tube
Inlet: Side with red mark
AIR
16 17
28
12
29
25
19
25
37
39
P
2K
180mm
300mm
250mm
250mm
Air resistance tube
Air resistance tube: (32)
Insert with rubber plug for port (27).

3.1.2.3 FPD

221-70049-93
FLOW CONTROLLER, H2-AIR, FPD

Reference No.	
11	221-18150-91
2PC,	N BELLOW VALVE, 2K
16	670-18558-11
2PC,	PRESSURE GAUGE, 200 KPA
17	018-21330
	TAPE, STICKER, 0.1 × 13 × 5
20	221-42080-92
1PC,	BRANCHED PIPE, AIR, FPD, V2
22	221-70483-91
1PC,	SOLENOID VALVE ASSY
24	035-60395-43
2PC,	GASKET
25	221-31745
2PC,	HOUSING
26	221-19502-08
1PC,	RESISTANCE TUBE, HYDROGEN, GC-8A
27	201-47435
4PC,	RUBBER PLUG, PORT, SILICON
28	221-09864-18
2PC,	PIPE, MF-MM17, 2 × 180
29	221-41408-94
1PC,	PIPE, PG-MF-MF ASSY
32	221-19503-08
2PC,	RESISTANCE TUBE, AIR, GC-8AF
33	221-41410-91
2PC,	PIPE, M5-MF ASSY
34	221-41527-92
1PC,	PIPE, PG-MF-MF-MMASS
36	221-70720-02
1PC,	FPD, RESISTANCE TUBE
37	201-48557-25
2PC,	PIPE, MN2W-MM2W
38	072-83071-08
1PC,	MARK BAND H
39	072-83071-01
1PC,	MARK BAND A

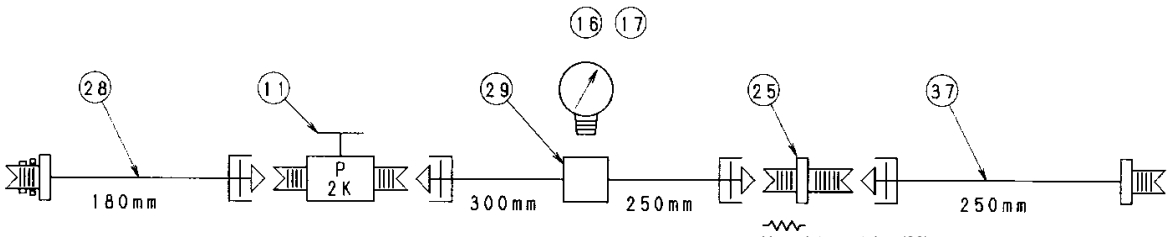
FPD


H2
AIR
180mm
300mm
250mm
50mm
P
2K
IN
OUT
H2 resistance tube: (26)
Insert with rubber plug for port (27).
Air resistance tube: (32)
Insert with rubber plug for port (27).

3.1.2.4 AUX

	Reference No.	
221-70049-94	11	221-18150-93
FLOW CONTROLLER, AUX	1PC,	N BELLOW VALVE, 2K, 8KIN
	16	670-18558-11
	2PC,	PRESSURE GAUGE, 200 KPA
	17	018-21330
		TAPE, STICKER, 0.1 × 13 × 5
	25	221-31745
	1PC,	HOUSING
	26	221-19502-08
	1PC,	RESISTANCE TUBE, HYDROGEN, GC-8A
	27	201-47435
	1PC,	RUBBER PLUG, PORT, SILICON
	28	221-09864-18
	1PC,	PIPE, MF-MM17, 2 × 180
	29	221-41408-94
	1PC,	PIPE, PG-MF-MF ASSY
	37	201-48557-25
	1PC,	PIPE, MN2W-MM2W

AUX



H_2 resistance tube: (26)
Insert with rubber plug for port (27).

3.1.3 APC (Optional)

Different APCs are used for each detector.

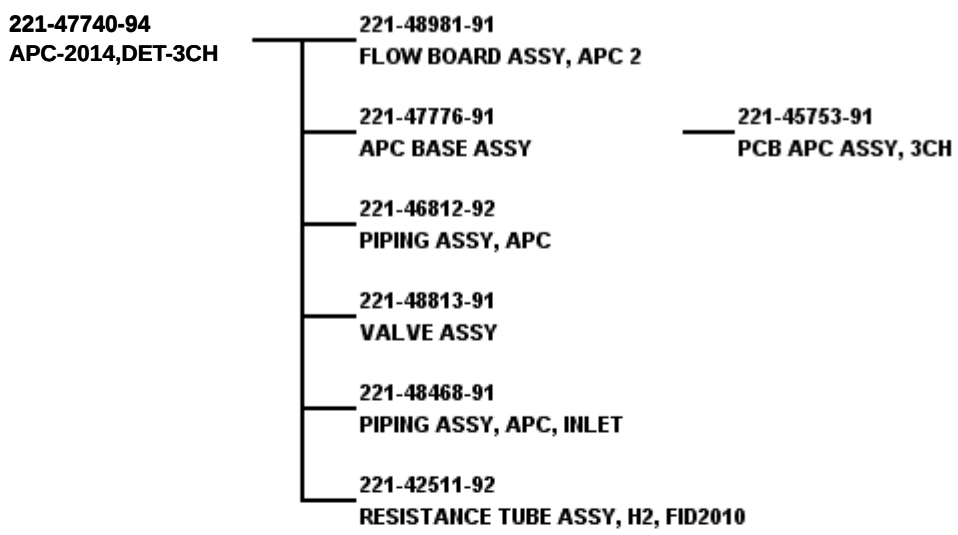
3ch APC: FID FTD

2ch APC: FPD

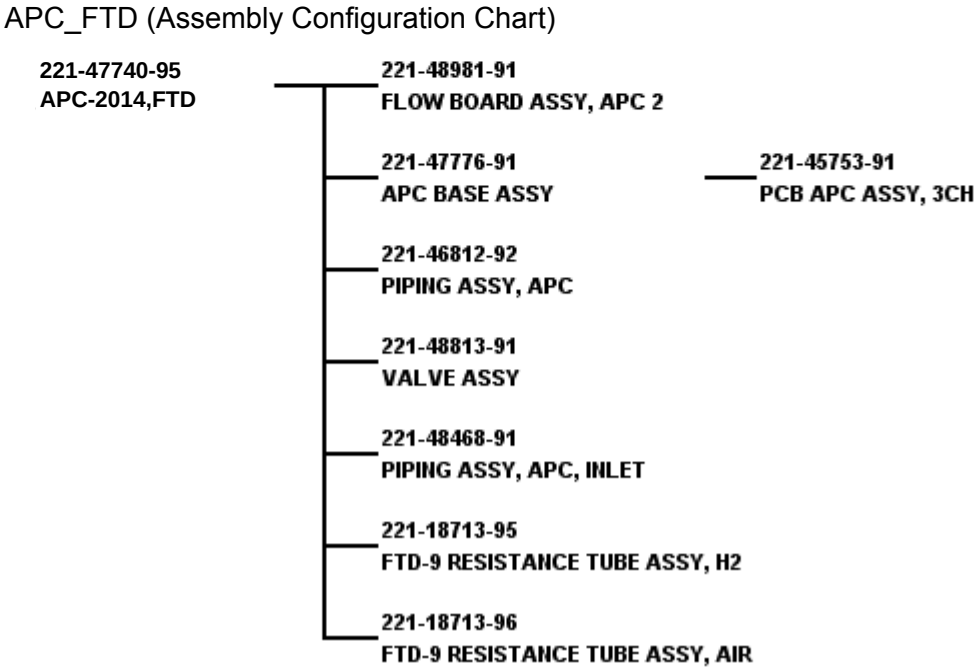
1ch APC: TCD ECD

3.1.3.1 3ch APC

APC_FID (Assembly Configuration Chart)

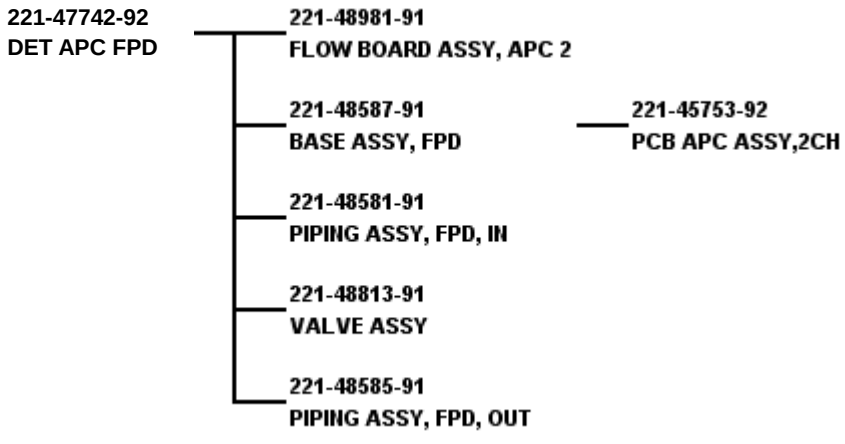


APC_FTD (Assembly Configuration Chart)



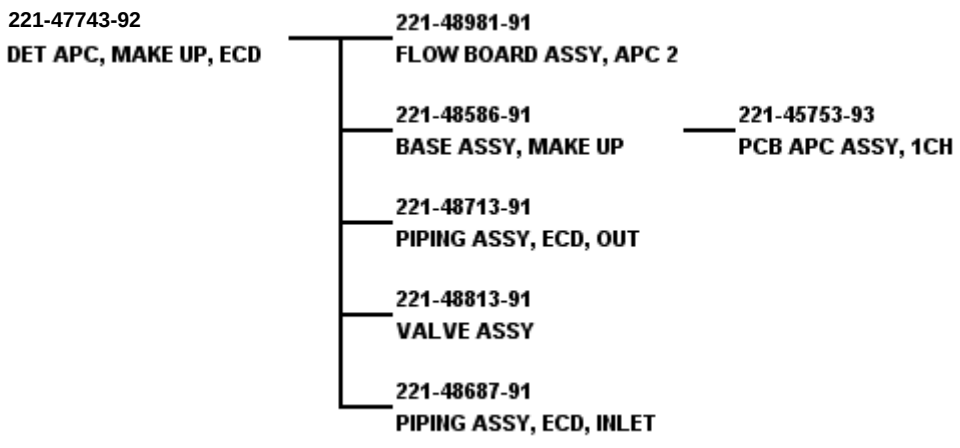
3.1.3.2 2ch APC

APC_FPD (Assembly Configuration Chart)



3.1.3.3 1ch APC

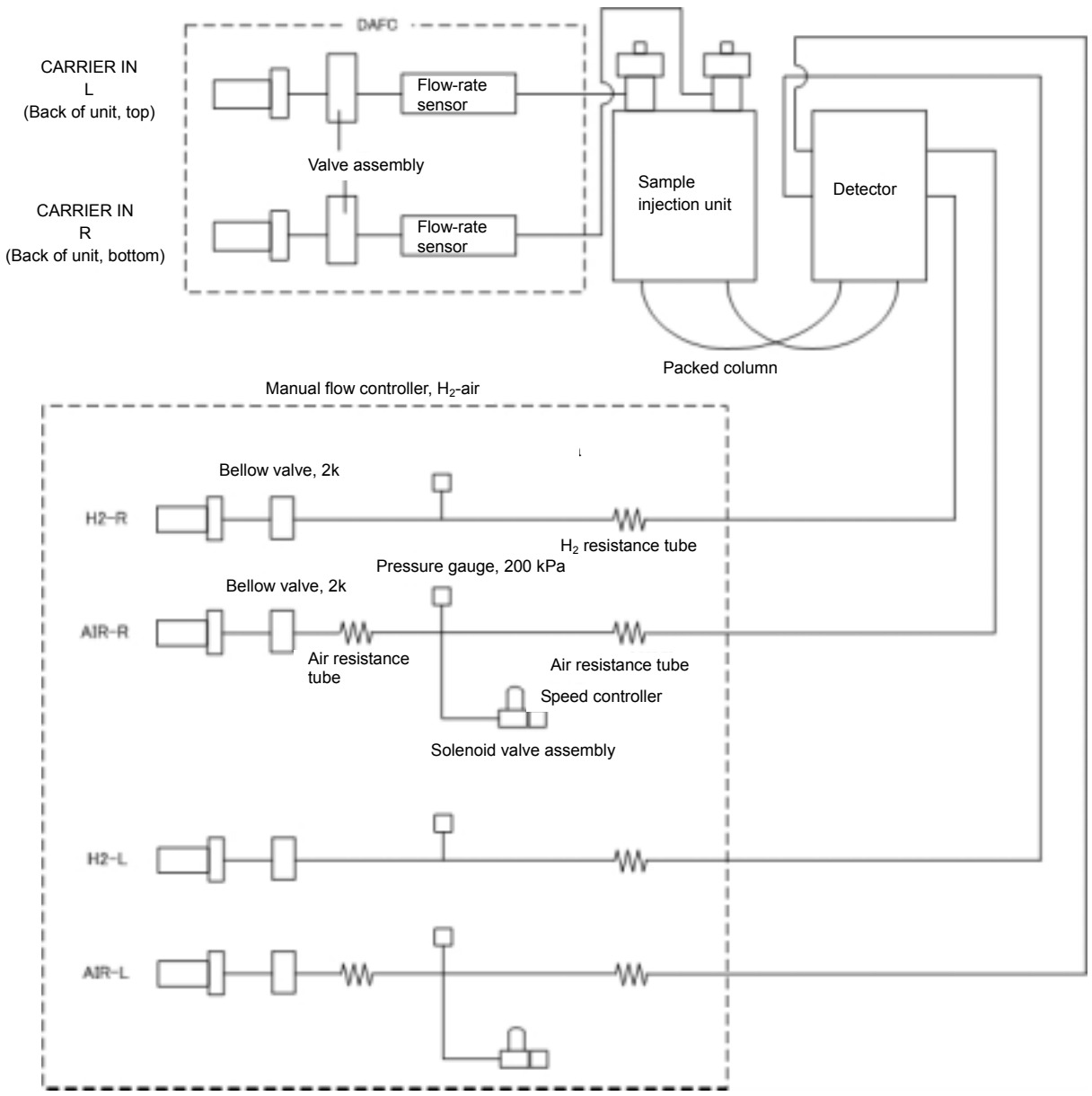
APC_ECD (Assembly Configuration Chart)



3.2 Flow-Line Diagram for Gas-Flow Controller

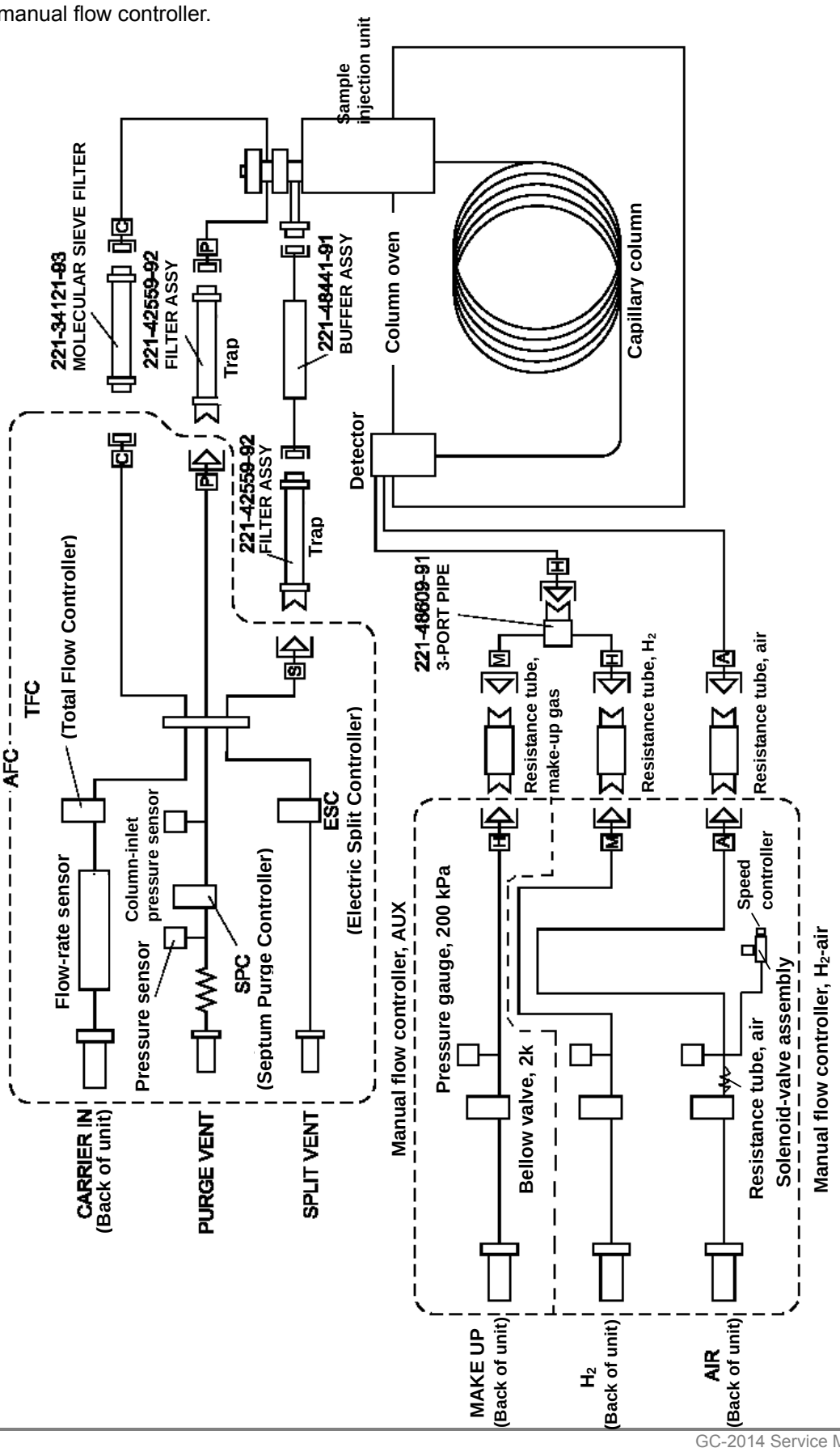
(1) Flow Line for Packed Dual Injection

The flow line shown applies for use in combination with a DAFC and a manual flow controller.



(2) Flow Line for SPL

The flow line shown applies for use in combination with AFC-2014, D-Purge, SPL, and a manual flow controller.



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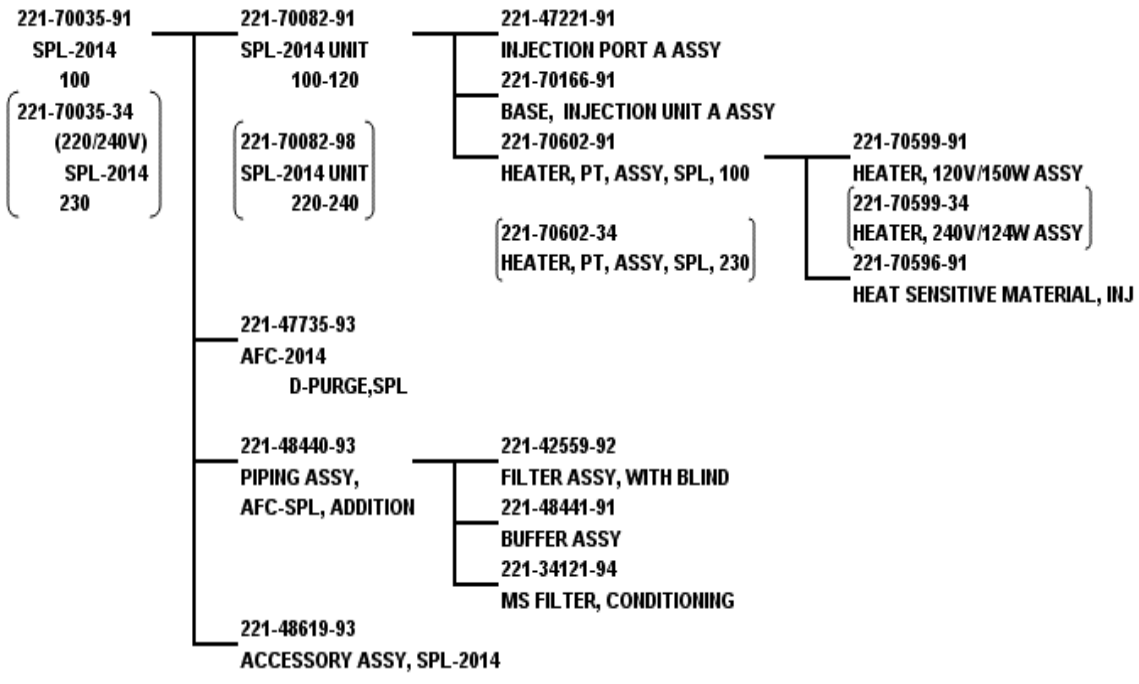
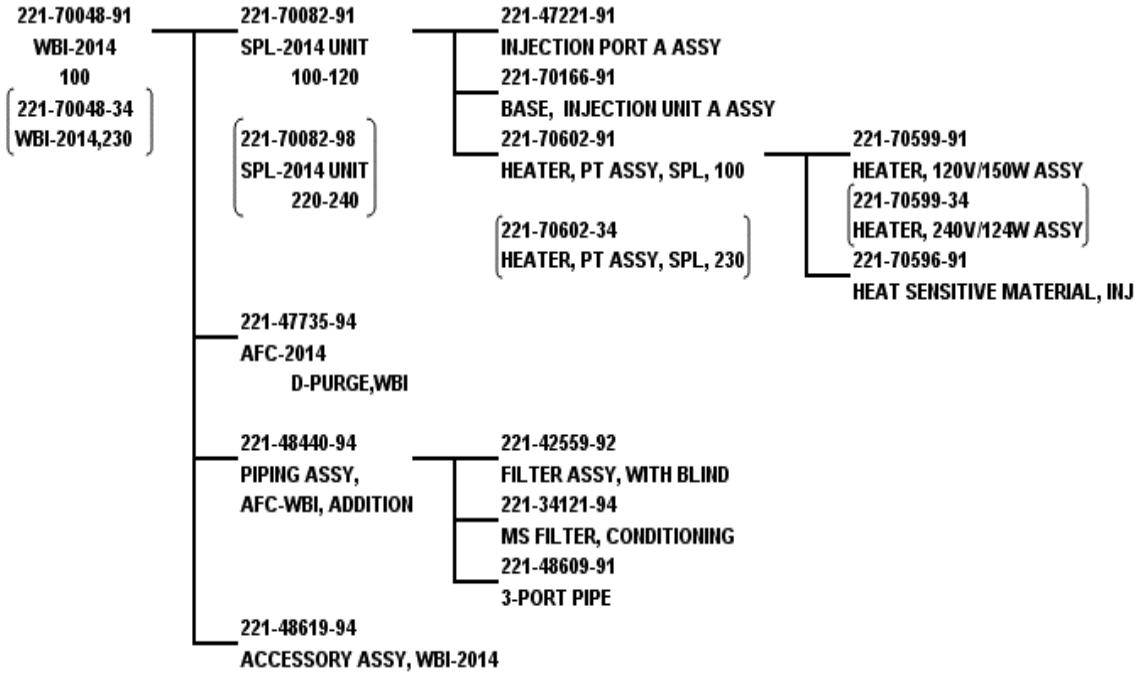
Chapter 4 Sample Injection Unit

4.1 Configuration Sample Injection Unit

SPL-2014 (Assembly Configuration Chart)

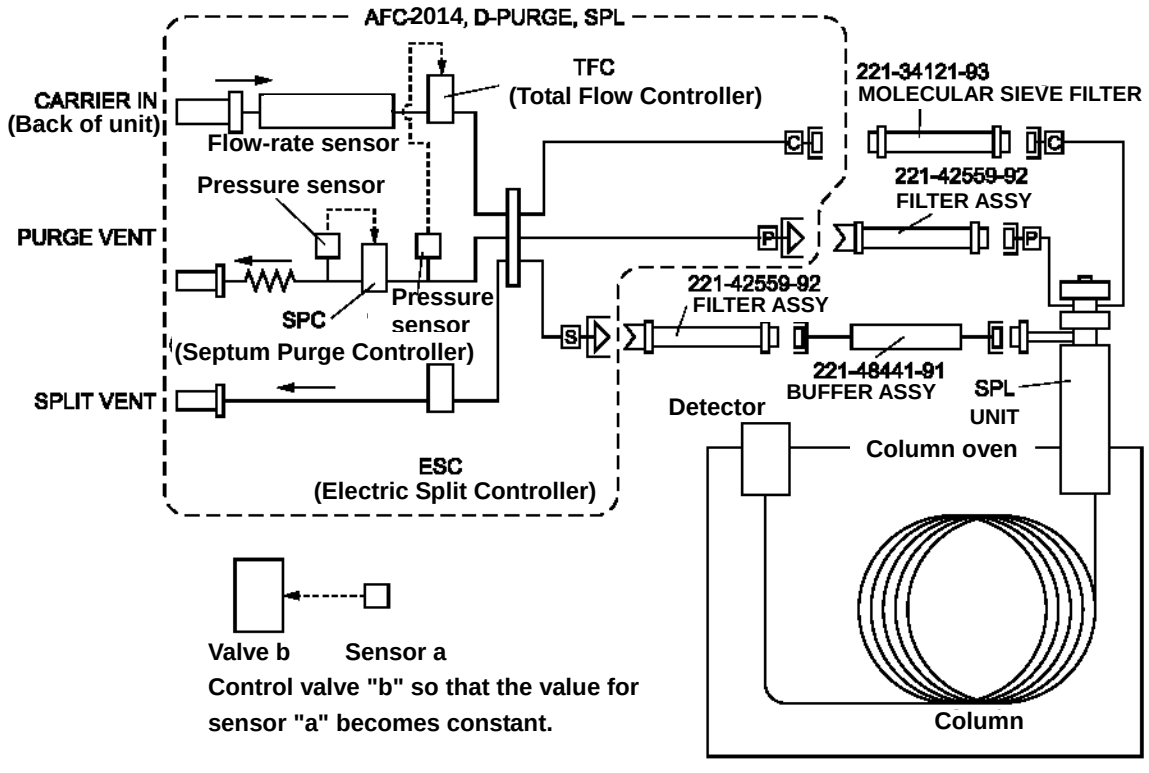


WBI-2014 (Assembly Configuration Chart)

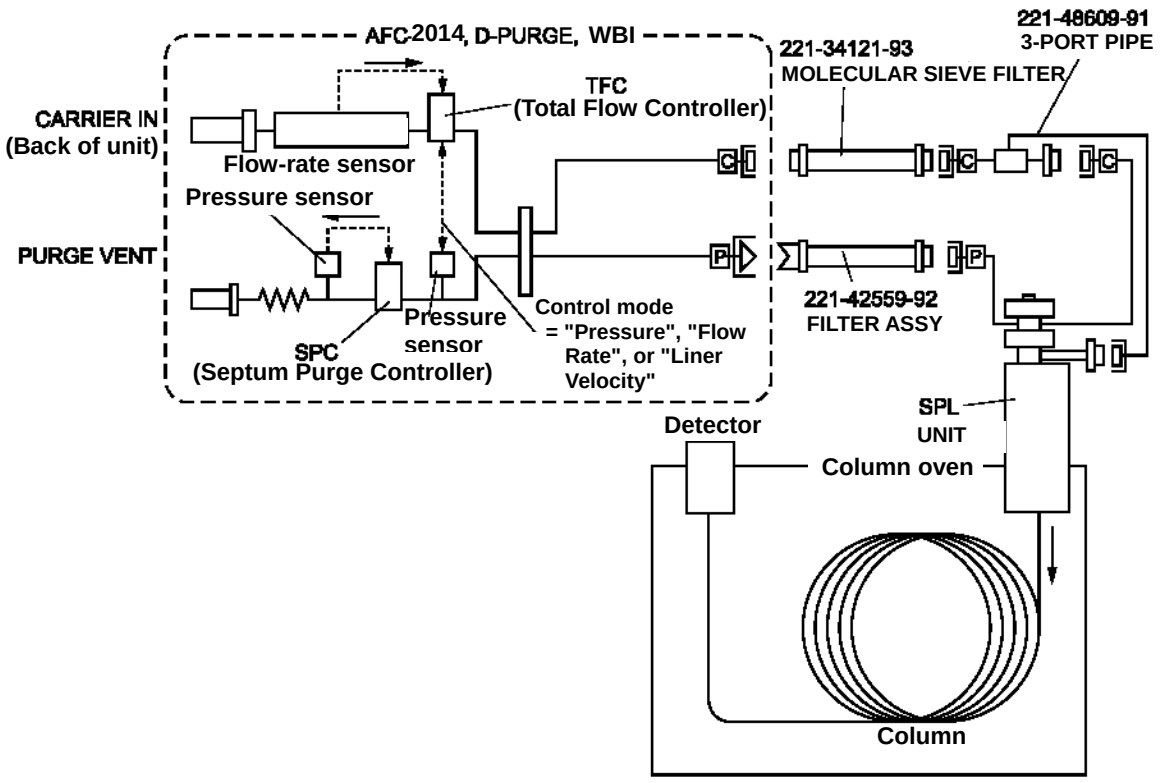


4.2 Piping for Sample Injection Unit

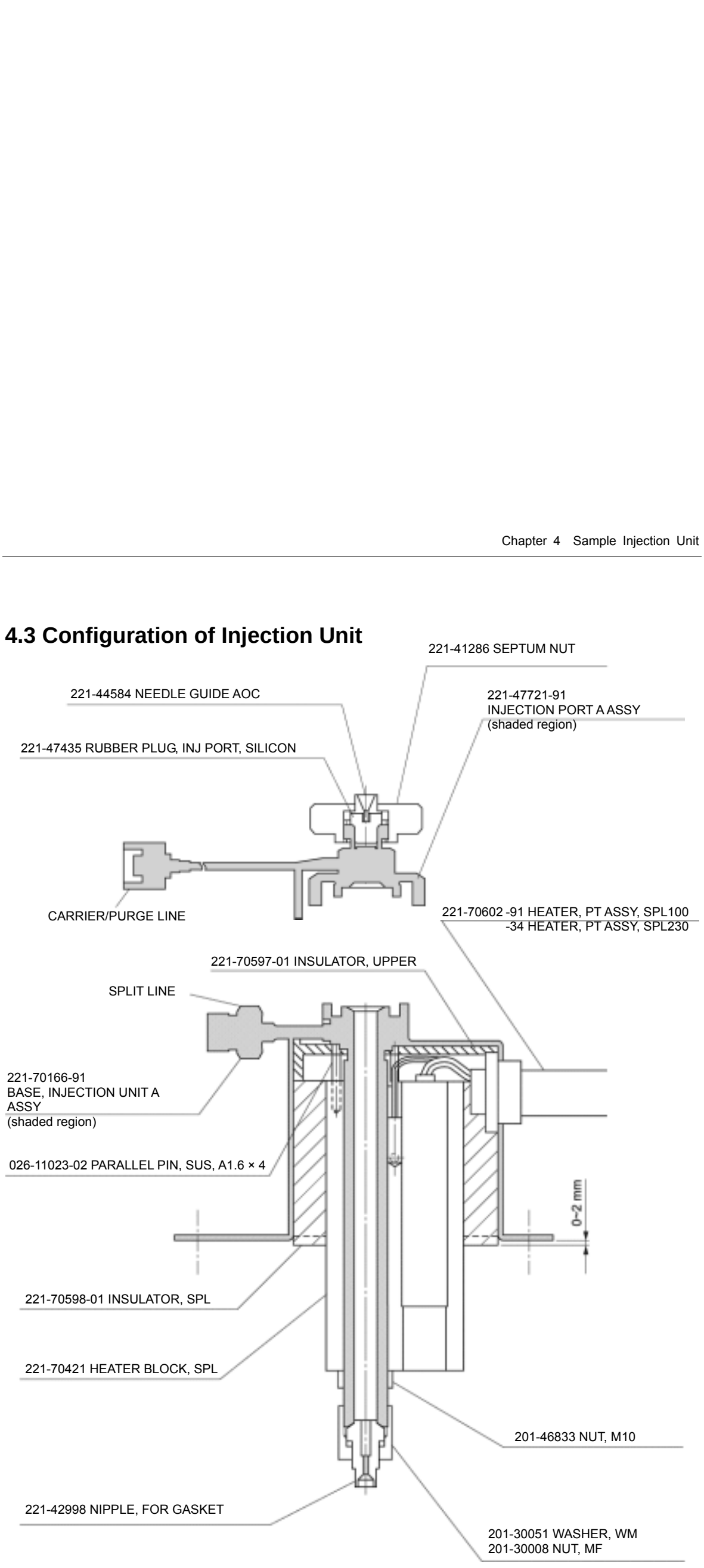
Piping for SPL-2014



Piping for WBI-2014



4.3 Configuration of Injection Unit



4.3.1 Heater Resistance Values for HEATER, PT ASSY, SPL, 100 and HEATER, PT ASSY, SPL, 230

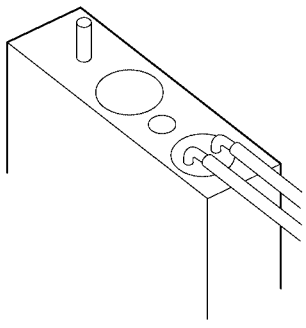
Model name	Heater resistance values
HEATER, PT ASSY, SPL, 100	90.0 to 99.3 Ω
HEATER, PT ASSY, SPL, 230	429.8 to 484.0 Ω

4.3.2 Recognized Resistance Values for HEATER, PT ASSY, SPL, 100 and HEATER, PT ASSY, SPL, 230

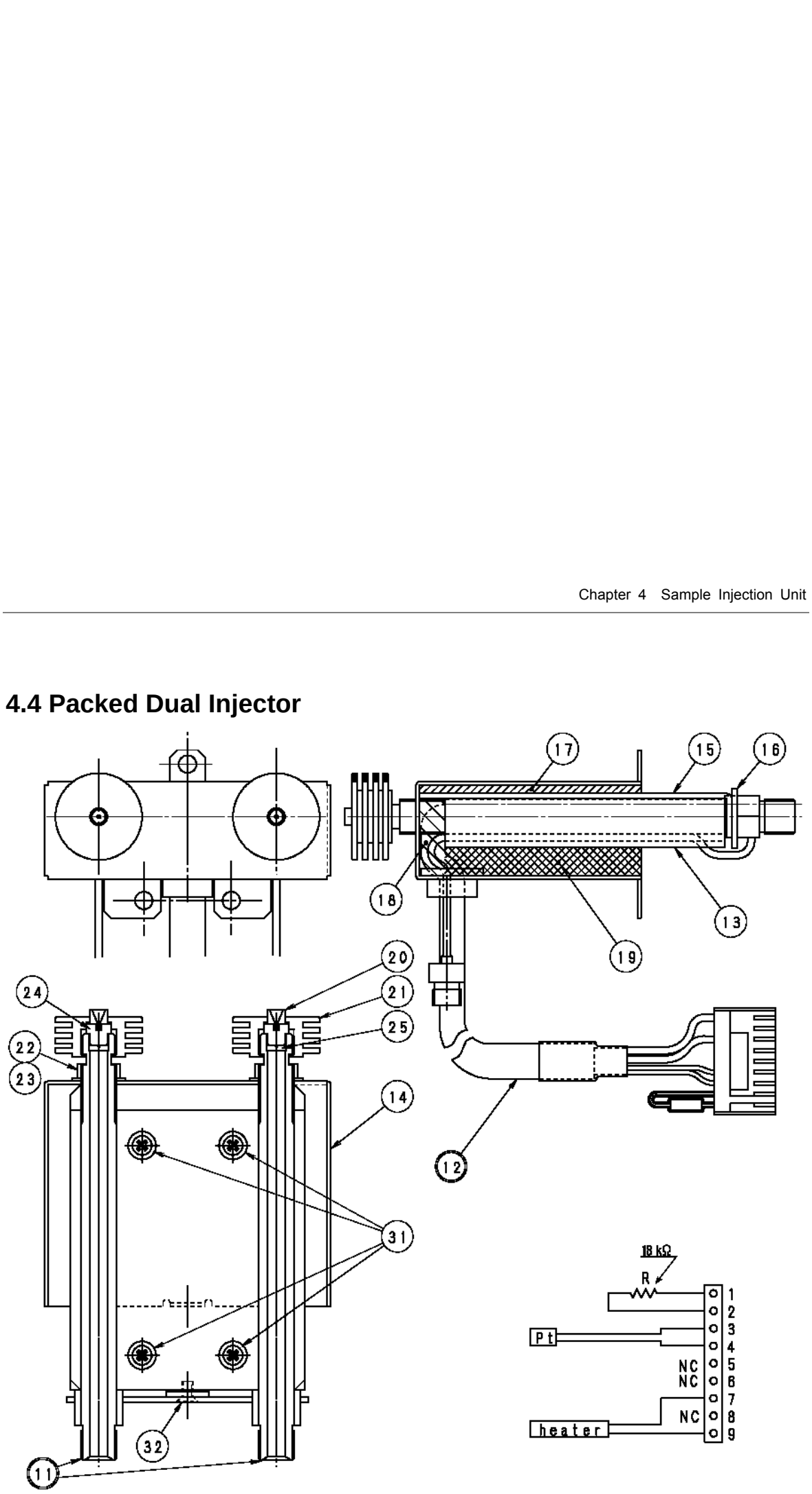
As shown in the configuration diagrams and flow-line diagrams for SPL-2014 and WBI-2014, the sample injection unit for SPL-2014 and WBI-2014 both use the SPL-2014 unit (for 100-120 V or 220-240 V), which has a recognized resistance value of 1 kΩ, regardless of the voltage type. For this reason, it is requested that the temperature-control port name is set by the user when installing the WBI-2014 so that SPL and WBI can be distinguished on the monitor screen.

4.3.3 Precautions for Replacing HEATER, PT ASSY, SPL, 100 and HEATER, PT ASSY, SPL, 230

Insert the heat-sensitive material in the heater block until it hits the bottom (depth: approx. 18 mm). Insert the heater in the heater block, with the orientation shown below, until it hits the bottom. To prevent short-circuiting of the lead wires, bend them at points 1 to 2 mm from the bottom while pressing them so as not to apply stress to the heater insulator.



4.4 Packed Dual Injector



Parts List for Packed Dual INJ, 221-70080-34 (230V), -81 (100V), -82 (115V)

Number	P/N	Part name	Quantity		
			230V	100V	115V
11	221-70189-91	INJECTION UNIT ASSY, 122	2	2	2
12	221-70479-34	HEATER, PT ASSY, P-INJ230	1		
12	221-70479-91	HEATER, PT ASSY, P-INJ100		1	
12	221-70479-92	HEATER, PT ASSY, P-INJ115			1
13	221-70188	HEATER BLOCK, DUAL INJ	1	1	1
14	221-70192	COVER, PACKED DUAL INJ	1	1	1
15	221-70193	HOLDING PLATE, HEATER	1	1	1
16	221-70196	LOCK RING	1	1	1
17	221-70480	HEAT SENSITIVE MATERIAL, PACKED 1	1	1	1
18	221-70481	HEAT SENSITIVE MATERIAL, PACKED 2	1	1	1
19	221-70482	HEAT SENSITIVE MATERIAL, PACKED 3	1	1	1
20	221-44584	NEEDLE GUIDE, AOC	2	2	2
21	221-70466	FIN, 2014	2	2	2
24	201-47435	RUBBER PLUG, INJ PORT, SILICON	2	2	2
25	221-22206	SPACER, INJ	2	2	2

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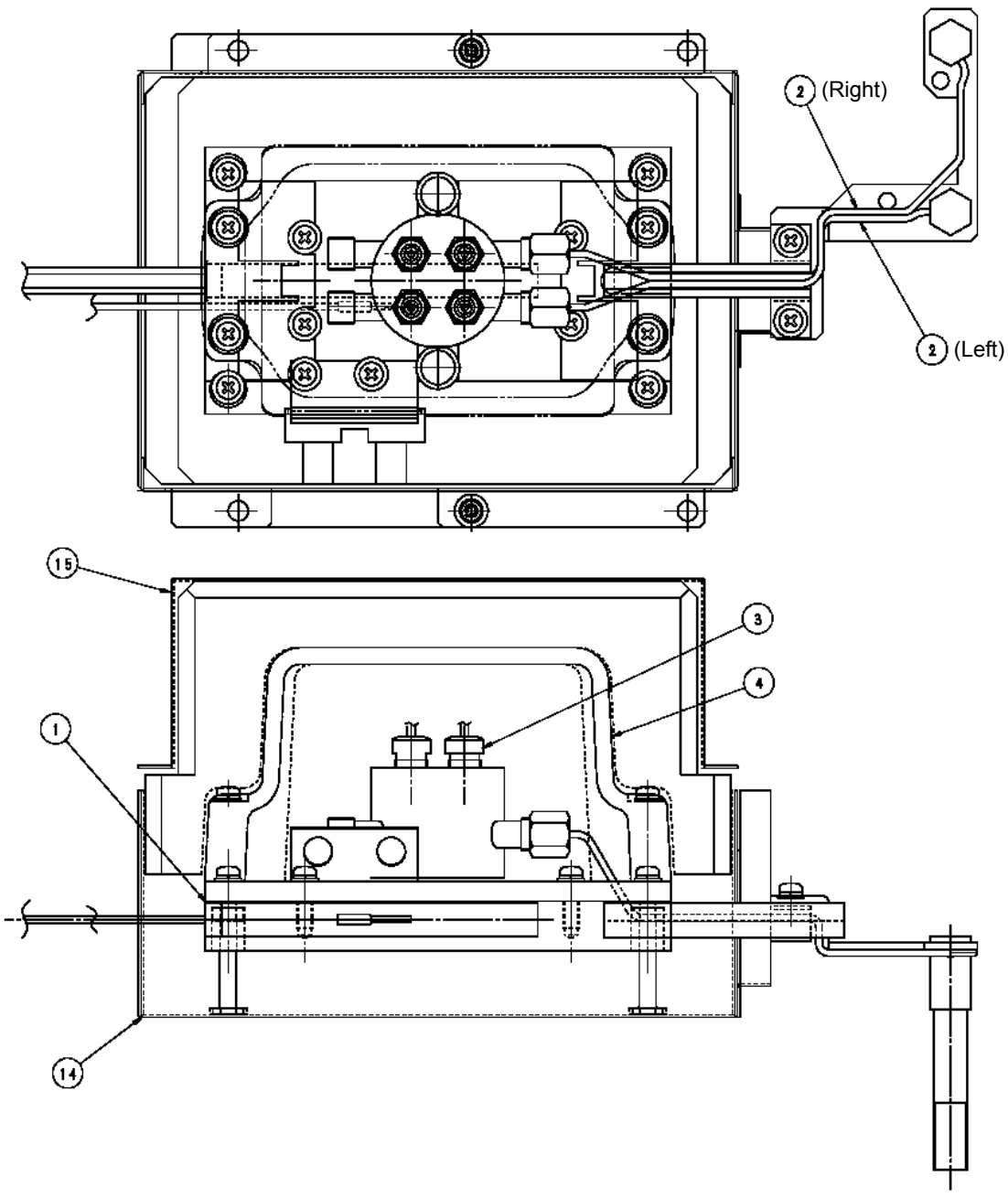
Chapter 5 Detector Unit

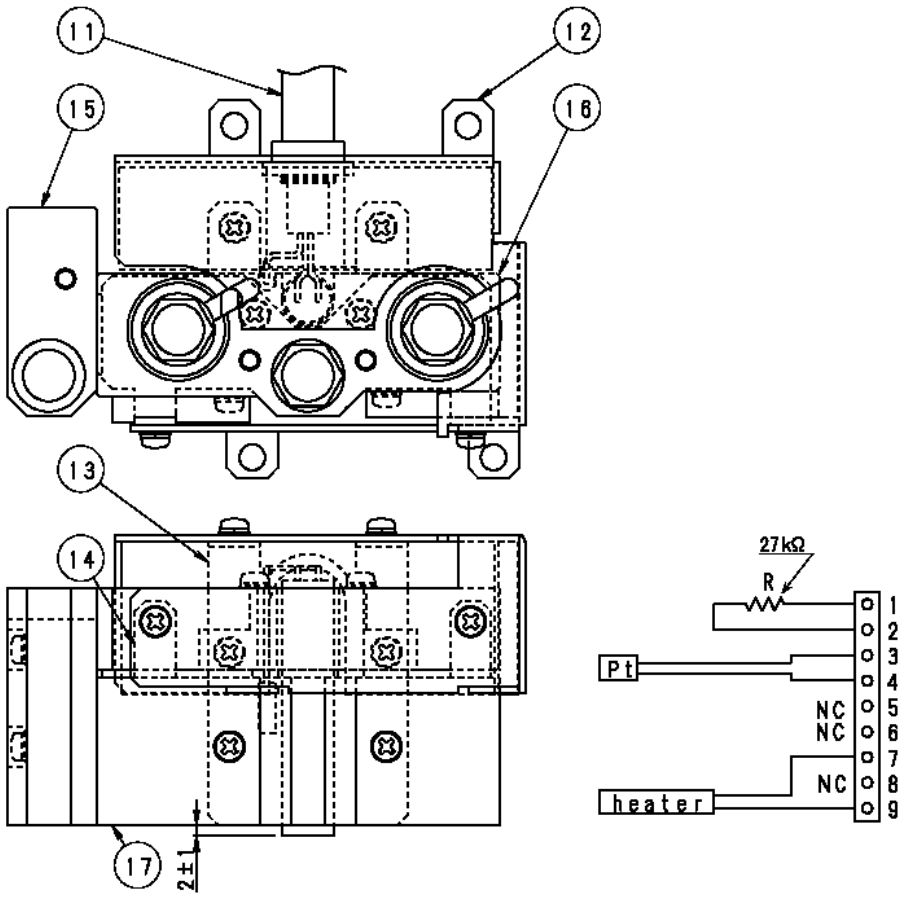
5.1 TCD



Parts List for TCD-2014 CELL ASSY, 221-70098-38 (230V), -81 (100V), -82 (115V)

Number	P/N	Part name	Quantity		
			230V	100V	115V
1	221-70743-34	HOT PLATE ASSY, 2014, 220V	1		
1	221-70743-91	HOT PLATE ASSY, 2014, 100V		1	
1	221-70743-92	HOT PLATE ASSY, 2014, 115V			1
2 (Left)	221-32577-91	PIPE ASSY, COL-TCD 1 (145mm)	1	1	1
2 (Right)	221-32577-92	PIPE ASSY, COL-TCD 2 (210mm)	1	1	1
3	221-70744-91	TCD, 100 OHMS, 2014	1	1	1
4	221-14018	BLOCK, DETECTOR COVER	1	1	1

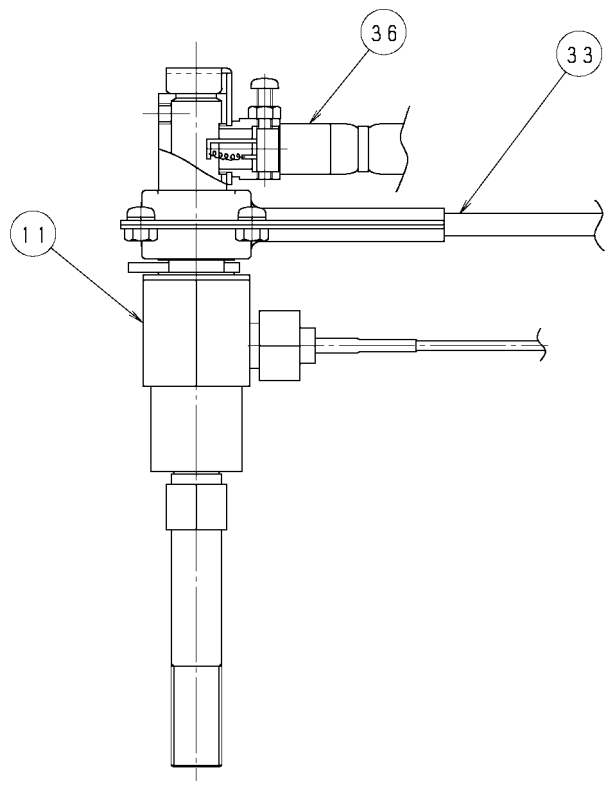
5.1.1 DET HEATER ASSY, FT



Parts List for DET HEATER ASSY, FT, 221-70086-34 (230V), -91 (100V), -92 (115V)

Number	P/N	Part name	Quantity		
			230V	100V	115V
11	221-70671-34	HEATER, PT ASSY, D-FID, 230	1		
11	221-70671-91	HEATER, PT ASSY, D-FID, 100		1	
11	221-70671-92	HEATER, PT ASSY, D-FID, 115			1
12	221-70125	DET, DUAL, UPPER COVER, TCD	1	1	1
13	221-70127	DET, DUAL, BLOCK PLATE A	1	1	1
14	221-70139	LOCK RING, DET, DUAL	1	1	1
15	221-70141	TCD BLOCK	1	1	1
16	221-70136	DET, DUAL, BLOCK, UPPER	1	1	1
17	221-70137	DET, DUAL, BLOCK, LOWER	1	1	1

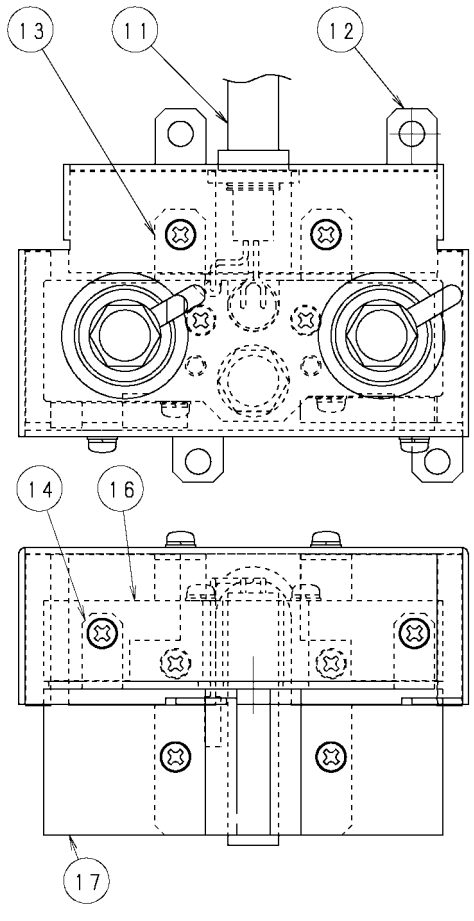
5.2 FID



Parts List for FID-2014 CELL ASSY, 221-70090-91

Number	P/N	Part name	Quantity
11	221-70630-91	FID-2014 CELL BASE ASSY	1
11-1	221-70298-91	BASE,MAIN ASSY, FID	1
11-2	221-70162-92	NOZZLE ASSY, PACKED	1
11-3	221-47146-92	HIGH VOLTAGE ELECTRODE, FID2014	1
33	221-47659-92	COLLECTOR ASSY, FID, 600MM	1
36	221-41847-93	FILAMENT ASSY, 180MM	1

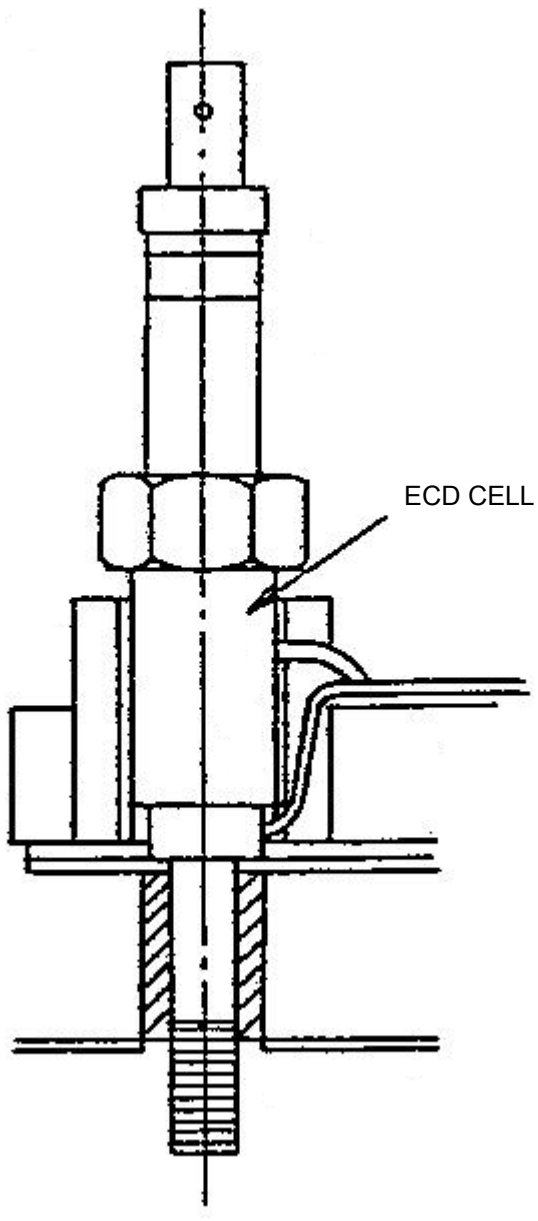
5.2.1 DET HEATER ASSY, F



Parts List for DET HEATER ASSY, F, 221-70085-34 (230V), -91 (100V), -92 (115V)

Number	P/N	Part name	230V	100V	115V
11	221-70671-34	HEATER, PT ASSY, D-FID 230	1		
11	221-70671-91	HEATER, PT ASSY, D-FID 100		1	
11	221-70671-92	HEATER, PT ASSY, D-FID 115			1
12	221-70124	DET, DUAL, UPPER COVER, FID	1	1	1
13	221-70127	DET, DUAL, BLOCK PLATE A	1	1	1
14	221-70139	LOCK RING, DET, DUAL	1	1	1
16	221-70136	DET, DUAL, BLOCK, UPPER	1	1	1
17	221-70137	DET, DUAL, BLOCK, LOWER	1	1	1

5.3 ECD

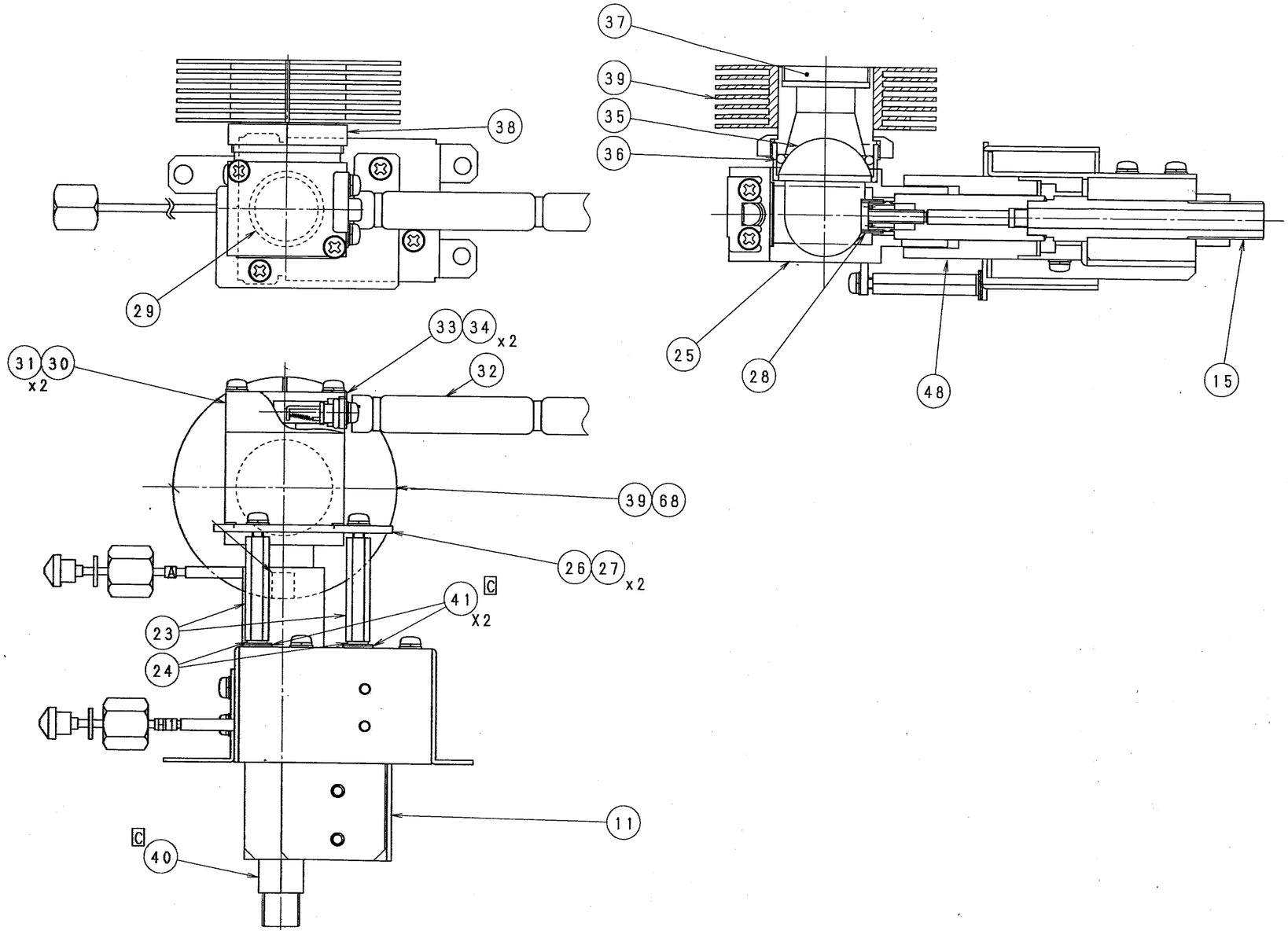


Configuration Diagram for ECD

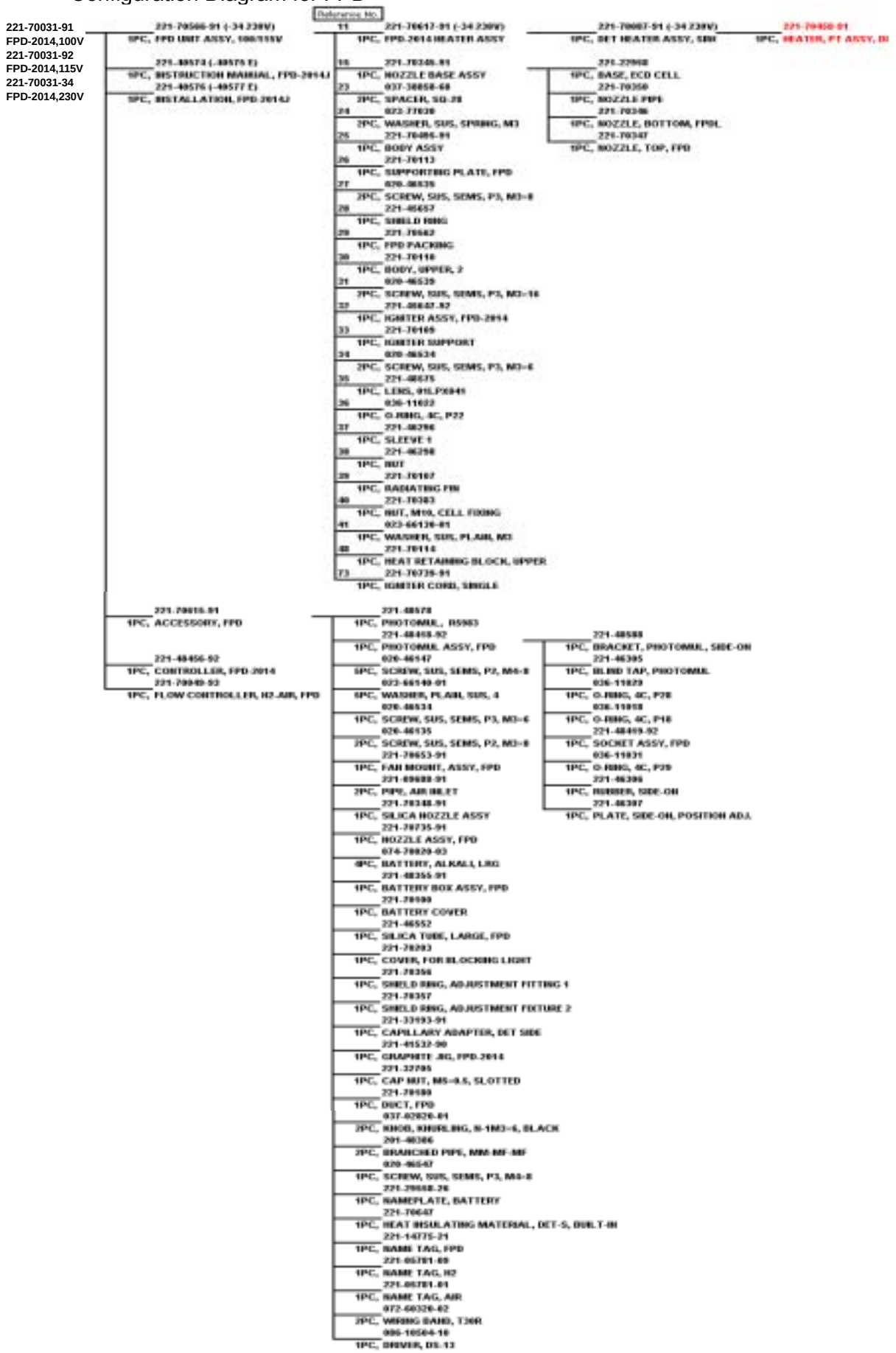
221-25055-91
ECD-9

- 221-70032-34
  ECD-2014, CONTROLLER, 230
  221-70032-91
  ECD-2014, CONTROLLER, 100
  221-47733-92
  ECD-2014, CONTROLLER, 115
- 221-70621-91
  - 1PC, ACCESSORY, ECD-2014
    221-40578(-40579 EN)
  - 1PC, INSTRUCTION MANUAL, ECD-2010J
    221-40580(-40581 EN)
  - 1PC, INSTALLATION, ECD-2010J
    221-48455-92
  - 1PC, CONTROLLER, ECD-2014
    221-70049-94
  - 1PC, FLOW CONTROLLER, AUX
    201-42870(221-07755 EN)
  - 2PC RI, NAMEPLATE
    221-07682(-29747 EN)
  - 1PC, NAMEPLATE, ECD VENT
    221-41639
  - 1PC, LABEL, ECD CAUTION
- 020-46147
  - 3PC, SCREW, SUS, SEMS, P2, M4×8
    023-66140-01
  - 3PC, WASHER, SUS, PLAIN, M4
    020-46534
  - 1PC, SCREW, SUS, SEMS, P3, M3×6
    020-46547
  - 2PC, SCREW, SUS, SEMS, P3, M4×8
    221-09688-91
  - 1PC, PIPE, AIR INLET
    221-70115
  - 1PC, ECD HEAT RETAINING BLOCK 1
    221-70883
  - 1PC, MOUNTING PLATE, DET, SINGLE, CENTER
    221-00816-04
  - 1PC, SIGNAL CABLE AS, ECD-2014
    221-16036-91
  - 1PC, ECD ACCESSORY, GC-7A
    221-70647
  - 1PC, HEAT INSULATING MATERIAL, DET-S, BUILT-IN
    221-70383
  - 1PC, NUT, M10, CELL FIXING
    221-32705
  - 1PC, CAP NUT, M5×0.5, SLOTTED
    221-33193-91
  - 1PC, CAPILLARY ADAPTER, DET SIDE
    221-41532-99
  - 1PC, GRAPHITE JIG, ECD-2014
    202-58258-02
  - 1PC, JOINT, GL-GN, 2X0.5MT
    201-48560-05
  - 1PC, PIPE, MF-GF, 50
    201-32069
  - 1PC, WASHER
    201-48464
  - 1PC, NUT M8
    221-48602-91
  - 1PC, MOLECULAR FILTER, WITH PLUG
    221-14775-73
  - 1PC, ADHESIVE NAMEPLATE, MAKE UP
    072-60320-02
  - 2PC, WIRING BAND, T30R

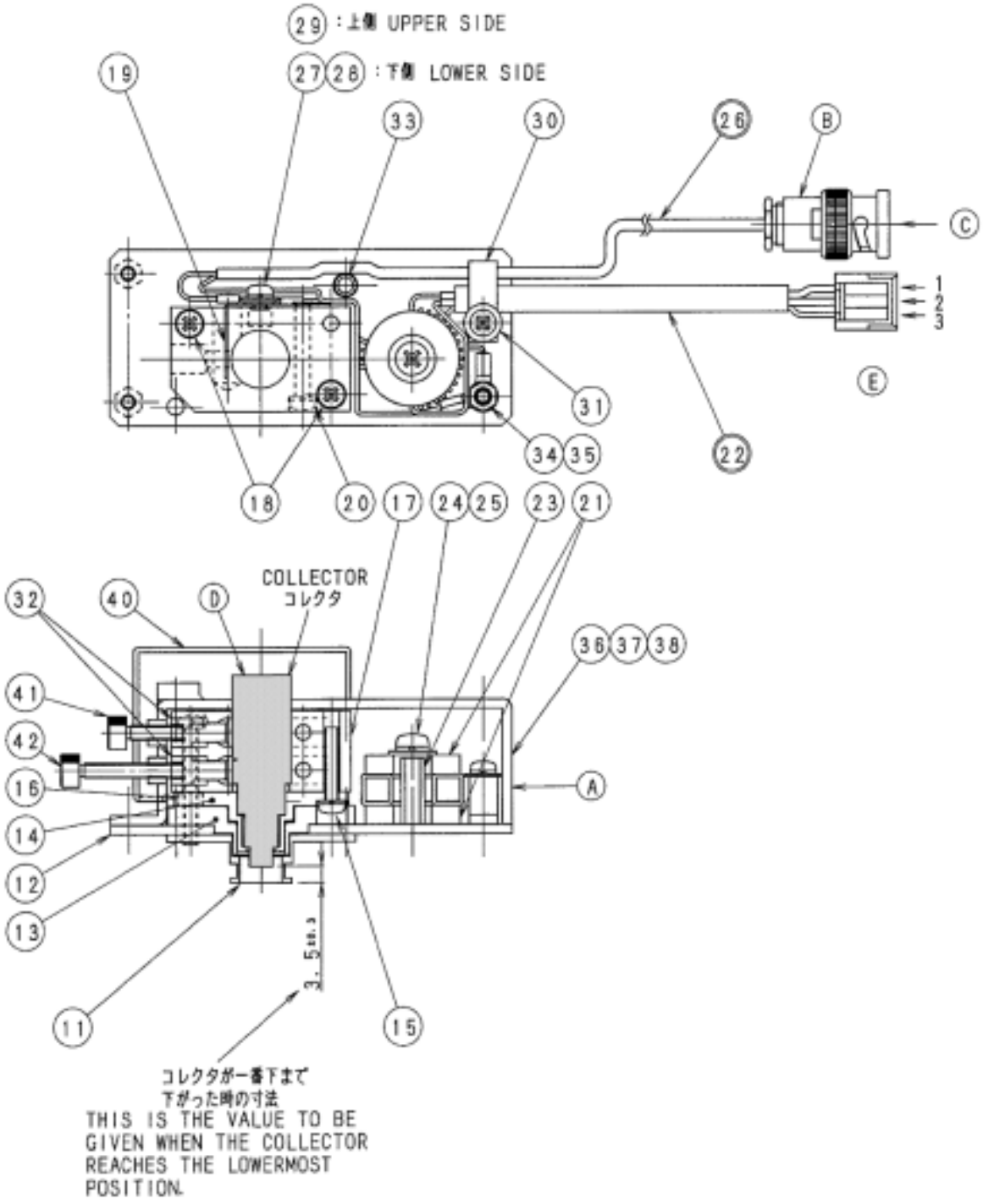
5.4 FPD


37
39
35
36
38
29
25
28
48
15
33
34
x2
31
30
x2
32
39
68
26
27
x2
C
41
X2
23
24
11
C
40

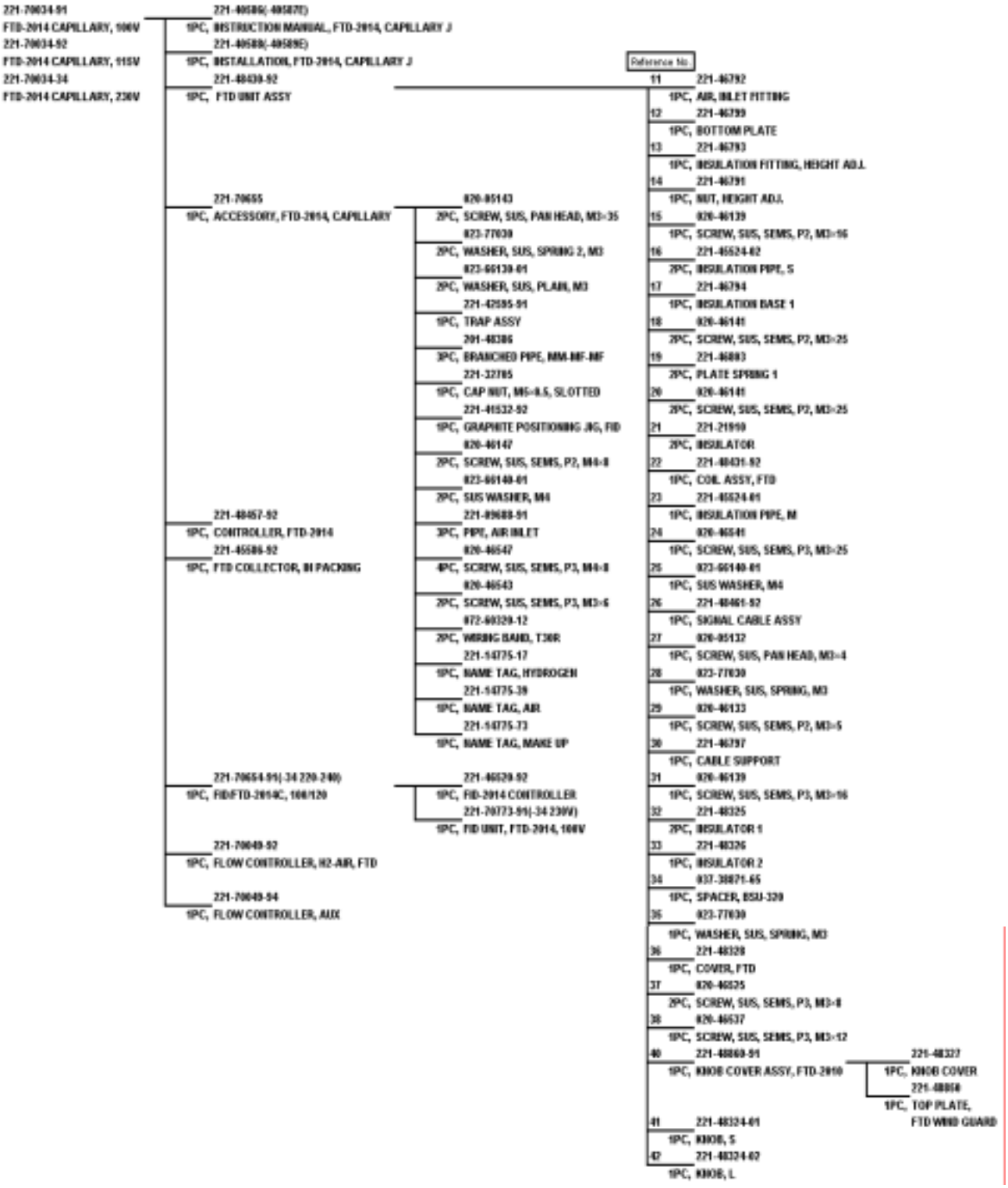
Configuration Diagram for FPD



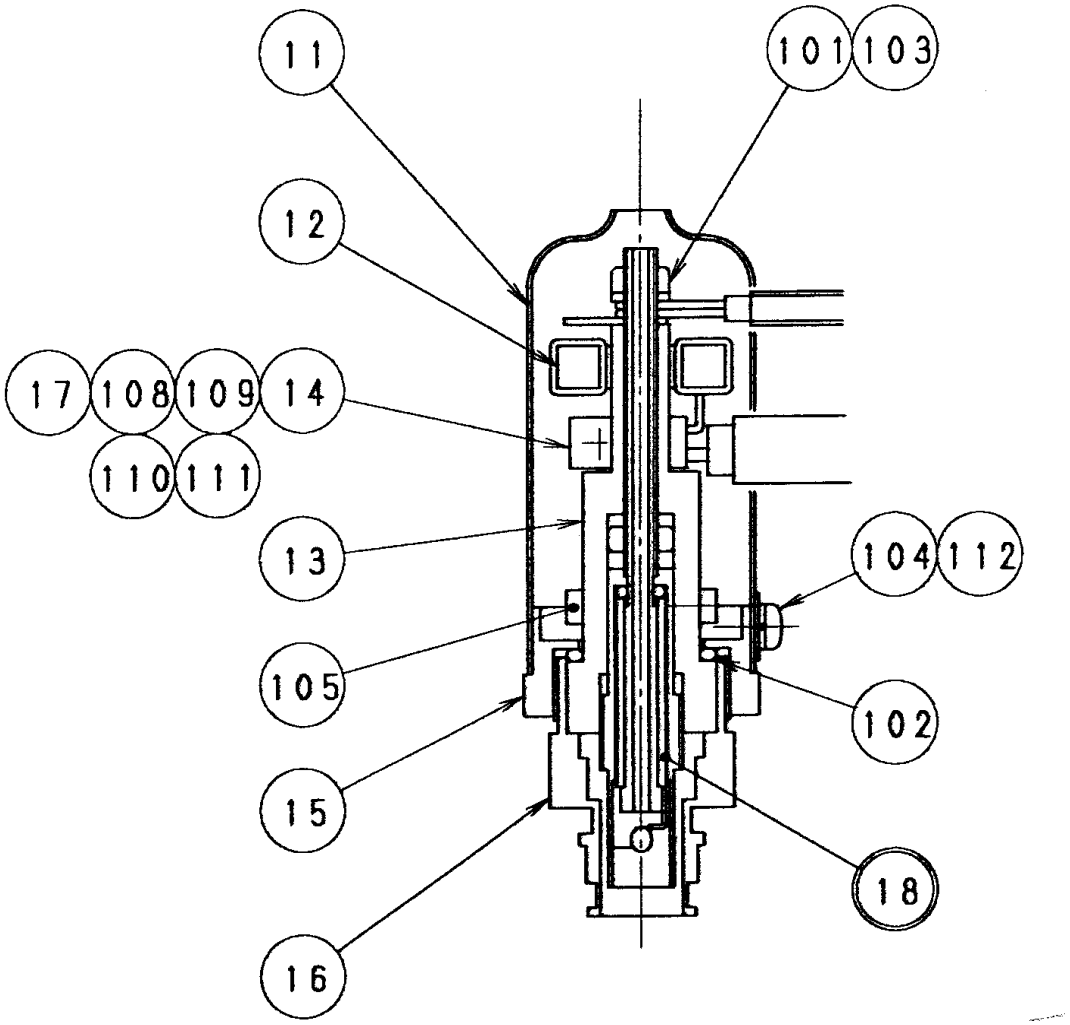
5.5 FTD-2014C

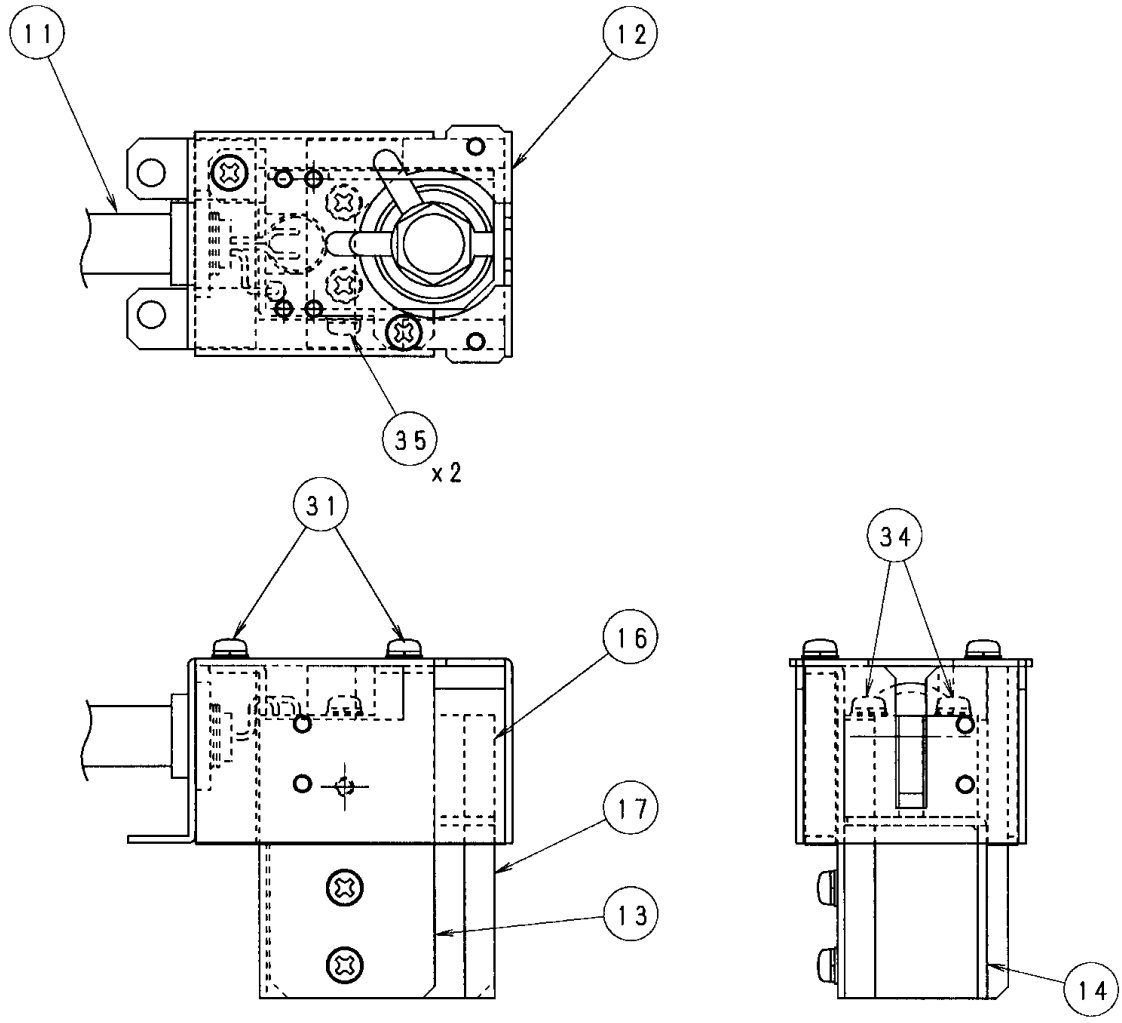

29 : 上側 UPPER SIDE
27 28 : 下側 LOWER SIDE
19
33
30
26
B
C
1
2
3
E
31
34 35
22
18
20
17
24 25
23
21
COLLECTOR
コレクタ
32
40
D
36 37 38
41
42
16
14
12
13
A
3.5±0.3
11
15
コレクタが一番下まで
下がった時の寸法
THIS IS THE VALUE TO BE
GIVEN WHEN THE COLLECTOR
REACHES THE LOWERMOST
POSITION.

Configuration Diagram for FTD-2014C

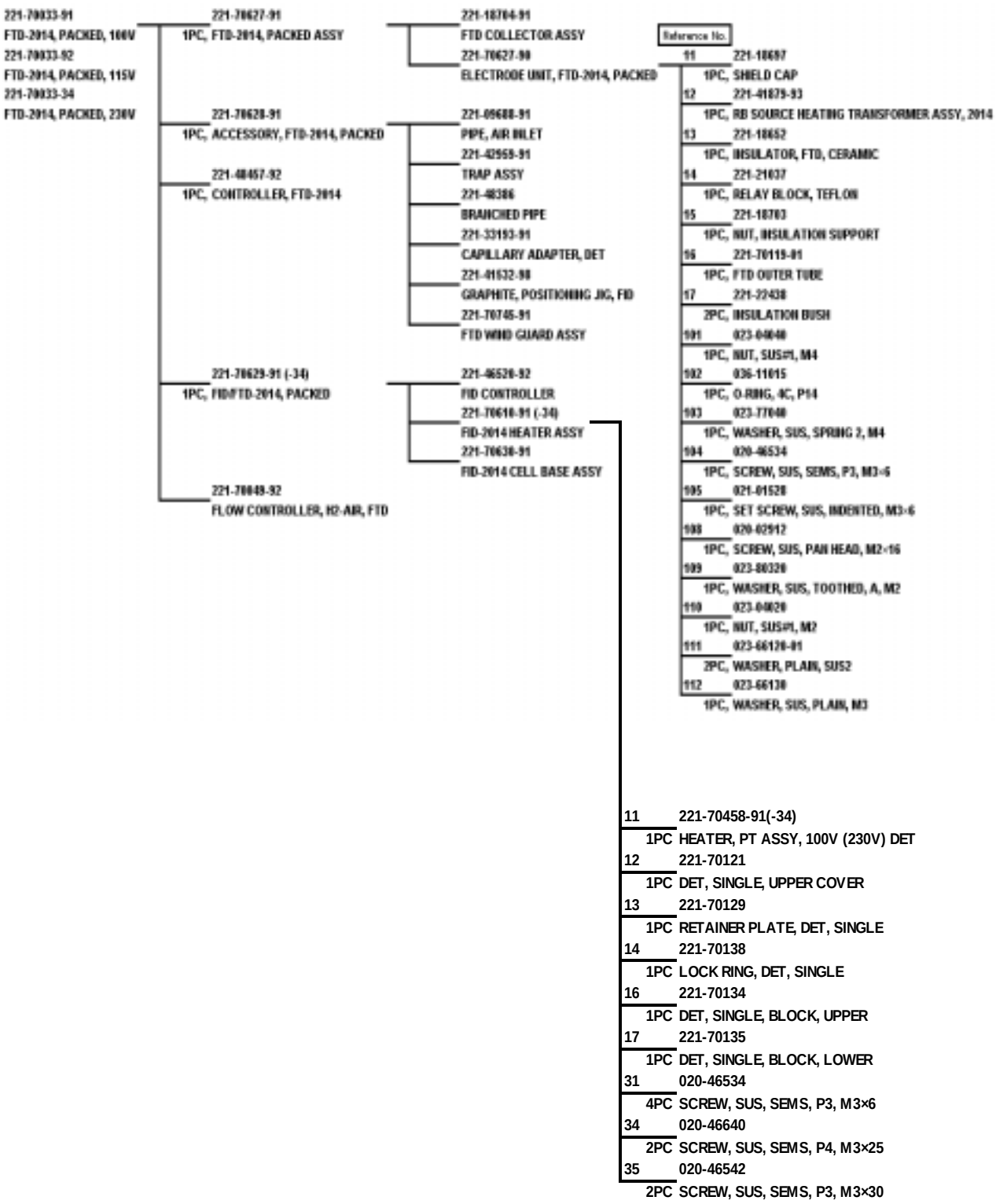


5.6 FTD-2014




11
12
35
x 2
31
16
17
13
34
14

Configuration Diagram for FTD-2014



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Chapter 6 Maintenance Parts Lists

<GC-2014 MAIN UNIT>

P/N	Part name	Remarks
072-01665-36	FUSE, 15A	100 V
072-02004-23	FUSE, 218, 15A	100 V
072-01665-34	FUSE, 10A	200 V
072-02004-21	FUSE, 218, 3.15A	200 V
074-73307-01	LITHIUM BATTERY	CR2032
074-80427-61	POWER SUPPLY, LEA100F-24	200 V
074-80654-77	POWER SUPPLY, VS100B-24	100 V
221-48721-91	LCD ASSY, GC-2010	Equipped with gasket
201-35584	RUBBER SEPTUM, INJ. PORT	20 per set
221-12949	FAN	100 V, 200 V
221-32126-05	GRAPHITE FERRULE, G-0.5	10 per set
221-32126-08	GRAPHITE FERRULE, G-0.8	10 per set
036-11203-84	O-RING, 4D, P5	For INJ (5 per set)
221-32705	CAP NUT, M5×0.5, SLOTTED	
221-16325	NUT, NOT SLOTTED	
221-34121-94	BUFFER TUBE ASSY	Aged
221-41286	SEPTUM NUT	
221-41444	GLASS INSERT, SPL17	
221-43597	COVER, RADIATING FIN	
221-49613-91	HEATER ASSY, COLUMN OVEN, 100 V	
221-49613-92	HEATER ASSY, COLUMN OVEN, 115 V	
221-49613-34	HEATER ASSY, COLUMN OVEN, 230 V	
221-43695-91	PT SENSER ASSY, COLUMN OVEN	
221-43696-91	THERMOCOUPLE ASSY, COLUMN OVEN	
221-43710	HOLDER, PT SENSOR	
221-44584	NEEDLE GUIDE, AOC	
221-70254-91	PCB DET I/F, GC2014	
221-45745-91	PCB FLOW I/F, GC-2010	
221-70250-91	PCB KEY ASSY, GC-2014	
221-46470-01	KEY RUBBER 1, KEY PANEL	
221-46471-01	KEY RUBBER 2, KEY PANEL	
221-70602-91	HEATER, PT ASSY, SPL100	
221-70602-34	HEATER, PT ASSY, SPL230	
221-47632-92	CPU UNIT, GC-2014	
221-70072-91	FAN MOTOR ASSY, 100 V	
221-70072-92	FAN MOTOR ASSY, 120 V	
221-70072-34	FAN MOTOR ASSY, 230 V	
221-47652	FLAP MOTOR	
221-47653-91	POWER SWITCH ASSY	
221-70082-81	SPL-2014 STOCKED,100-120	●SPL, 100 V (tested for gas leaks and aged)
221-70082-38	SPL-2014 STOCKED,220-240	●SPL, 200 V (tested for gas leaks and aged)
221-47735-93	AFC-2014 ASSY	●For SPL
221-48335-01	GLASS INSERT, SPLITLESS/WBI	
221-48398-91	HIGH-TEMPERATURE SEPTUM	20 per set
221-48460-92	POWER UNIT	100 V
221-48460-39	POWER UNIT, CE	200 V
221-48600	SILICA WOOL, 2 G	Deactivated
221-47251-91(-31)	CHROMATOPAC SIGNAL CABLE, WIDE (CE)	For wide-range output ("-31" model is CE compatible.)
221-47251-92(-32)	CHROMATOPAC SIGNAL CABLE, LINEAR (CE)	For linear output ("-32" model is CE compatible.)

< FID-2014, SINGLE >

P/N	Part name	Remarks
221-70610-91	FID-2014 HEATER ASSY, 100	FID, 100 V
221-70610-34	FID-2014 HEATER ASSY, 230	FID, 200 V
221-70630-91	FID-2014 CELL BASE ASSY	
221-47659-91	COLLECTOR ASSY, FID	
221-46520-92	FID-2014 CONTROLLER	
221-21910	INSULATOR, CERAMIC	For FID collector
221-19503-08	RESISTANCE TUBE, AIR	Resistance tube only (for air)
221-19502-08	RESISTANCE TUBE, H2	Resistance tube only (for make-up gas)
221-31745	HOUSING, RESISTANCE TUBE	
221-70091-91	FID-2014 ASSY, 100-120 V	FID, 100 V
221-70091-98	FID-2014 ASSY, 220-240 V	FID, 200 V
201-48386	3-WAY SPLIT TUBING, M-TYPE	
221-70162-92	NOZZLE ASSY, PACKED	
221-41532-98	GRAPHITE POSITIONING JIG, FID-2014	
221-41847-93	FILAMENT ASSY, FID	
221-70049-91	FLOW CONTROLLER, H2-AIR, FID	
221-70298-91	BASE, MAIN ASSY, FID	
221-47146-92	HIGH VOLTAGE ELECTRODE, FID2014	

< FPD-2014 >

P/N	Part name	Remarks
221-70562	FPD PACKING	
036-11022	O-RING, 4C, P22	
201-48386	3-WAY SPLIT TUBING, M-TYPE	
221-19502-08	RESISTANCE TUBE, H2	Resistance tube only (for H_2)
221-31745	HOUSING, RESISTANCE TUBE	
221-33193-91	CAPILLARY ADAPTER, DET SIDE	
221-46552	SILICA TUBE, LARGE	
221-46310-01	S FILTER, FPD (GC-2010)	
221-46310-02	G FILTER, FPD (GC-2010)	
221-46310-03	Sn FILTER, FPD (GC-2010)	
221-48456-92	FPD-2010 CONTROLLER	
221-45647-91	IGNITER ASSY, FPD	
221-70617-91	FPD-2014, HEATER UNIT, 100	FPD, 100 V
221-70617-34	FPD-2014, HEATER UNIT, 230	FPD, 200 V
221-70778-91	FAN ASSY, FPD	For filter cooling
221-70049-93	FLOW CONTROLLER, H2-AIR, FPD	
221-48578	PHOTOMULTIPLIER, R5983	

< FTD-2014, CAPILLARY >

P/N	Part name	Remarks
201-48386	3-WAY SPLIT TUBING, M-TYPE	
221-18713-95	RESISTANCE TUBE ASSY, H2	For FTD
221-18713-96	RESISTANCE TUBE ASSY, AIR FTD-9	For FTD
221-21910	INSULATOR, CERAMIC	
221-19502-08	RESISTANCE TUBE, H2	Resistance tube only (for make-up gas)
221-31745	HOUSING, RESISTANCE TUBE	
221-34121-94	MS FILTER	Aged
221-48258-91	NOZZLE ASSY, FID	
221-41532-92	GRAPHITE POSITIONING JIG, FID	
221-45586-91	FTD COLLECTOR (GC-2010)	
221-46520-92	FTD-2014 CONTROLLER	
221-48457-92	FTD-2010 POWER CONTROLLER	
221-47658-91	MAIN PART, BASE ASSY, FTD	
221-70049-92	FLOW CONTROLLER, H2-AIR-FTD	
221-47660-91	HEATER, PT, ASSY, 120V, DET	FID, 100V
221-47660-98	HEATER, PT, ASSY, 240V, DET	FID, 200 V

< FTD-2014, PACKED >

P/N	Part name	Remarks
201-48386	3-WAY SPLIT TUBING, M-TYPE	
221-18713-95	RESISTANCE TUBE ASSY, H2	For FTD
221-18713-96	RESISTANCE TUBE ASSY, AIR FTD-9	
221-34121-94	MS FILTER	Conditioned
221-70162-92	NOZZLE ASSY, PACKED	
221-18704-91	FTD COLLECTOR (STANDARD)	For general use
221-42512-91	FTD COLLECTOR (SPECIAL)	For pesticide analysis
221-46520-92	FID-2014 CONTROLLER	
221-48457-92	CONTROLLER, FTD-2014	
221-70298-91	MAIN PART, BASE ASSY, FID	
221-70049-92	FLOW CONTROLLER, H2-AIR-FTD	
221-70610-91	FID-2014 HEATER ASSY, 100	
221-70610-34	FID-2014 HEATER ASSY, 230	
221-70662	FTD CABLE, PTFE PACKING	Collector-cover packing

< ECD-2014 >

P/N	Part name	Remarks
221-70049-94	FLOW CONTROLLER, AUX	
221-70623-91	ECD-2014, HEATER ASSY, 100	FID, 100 V
221-70623-34	ECD-2014, HEATER ASSY, 230	FID, 230 V
221-48455-92	ECD-2014 CONTROLLER	
221-33193-91	CAPILLARY ADAPTER, DET SIDE	
221-34121-94	MS FILTER	Aged
221-19502-08	RESISTANCE TUBE ASSY, H2	Resistance tube only (for make-up gas)
221-31745	HOUSING, RESISTANCE TUBE	

< TCD-2014 >

P/N	Part name	Remarks
221-70041-91	TCD-2014 CONTROLLER	
221-70086-91	DET HEATER ASSY, FT, 100	
221-70086-34	DET HEATER ASSY, FT, 230	
221-70043-91	TCD POWER SUPPLY	

< D-FID >

P/N	Part name	Remarks
221-70040-91	FID-2014 CONTROLLER, DUAL	
221-70085-91	DET HEATER ASSY, F, 100 V	
221-70085-34	DET HEATER ASSY, F, 230 V	

< D-INJ. >

P/N	Part name	Remarks
221-70075-91	DUAL AFC ASSY	
221-70479-91	HEATER, PT ASSY, P-INJ 100	
221-70479-34	HEATER, PT ASSY, P-INJ 230	
221-70466	FIN, 2014	
221-22206	SPACER, INJ	

< OTHER >

P/N	Part name	Remarks
221-47735-94	AFC-2014 WBI	For WBI
221-44496-91	PCB, POWER SUPPLY, AOC-20I	
221-44548-94	AOC-20I ATTACHMENT PARTS, GC-2014	
221-48545-92	AOC-20I ATTACHMENT KIT, GC-2014	For external power supply

Chapter 7 Troubleshooting

When performing troubleshooting, first refer to the chapter on troubleshooting in the instruction manual. This chapter mainly describes possible causes and countermeasures not covered by the instruction manual. Refer to the item applicable to the symptoms displayed by your instrument.

7.1 Gas and Pressure/Flow-Rate Settings

7.1.1 Precautions for Flow-Rate Control Settings (CAR)

7.1.1.1 When the control mode is "SPLIT" or "SPLITLESS":

(1) The total flow rate fluctuates (unstable).

- Check that I time = 1, P term = 15, and I term = 40.

  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check for fluctuations in the cylinder's source pressure.
- If the source pressure is shared (e.g., the helium carrier gas is used for the detector's make-up gas and carrier gas), check for pressure fluctuations in the other line.

(2) The total flow rate is lower than the setting.

- Check whether or not the source pressure (i.e., the primary pressure) has been attained.
  The source pressure can be ascertained by viewing the "Actual" value for the primary pressure in the Flow Adjust window. It is not necessary to remove any piping.
- Check whether or not the setting is within the range of settable pressures/flow rates for AFCs. (A graph is given in the section on AFCs in the GC-2014 instruction manual.)
- Check that a blind has not been erroneously attached to a split bent and that there is no clogging.
- Check that I time = 1, P term = 15, and I term = 40.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values for the flow rate.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 6,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.
- Check that the status is not "Flow off" or "System off".
  If 0 is displayed as the valve voltage, this indicates that there is no voltage being supplied from the control system to the valve (TFC, Total Flow Controller) that is attempting to supply carrier gas to INJ.

(3) The total flow rate is higher than the setting.

- Check that I time = 1, P term = 15, and I term = 40.

  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values for the flow rate.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 6,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.
- If the gas is still flowing into the carrier line even when the power is turned OFF, replace the AFC.

(4) The inlet pressure fluctuates (unstable).

- Check that I time = 1, P term = 100, and I term = 150.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- If a glass insert for WBI is used, set the column insertion length (normally 34 mm) to approx. 15 mm.
- Set the inlet pressure to 0 kPa and the total flow rate to 400 ml/min. At this time, pressure is generated due to the flow-line resistance of the split line. The specified value for this pressure is 50 kPa or less. (The effective value is 30 kPa or less.) If it is greater than 50 kPa, identify the place where resistance exists using the following procedure.
  Remove the AFC's piping-line joint with the "s" mark band, one piece at a time. If the pressure decreases when the joint on the lower stream of the filter is removed, resistance exists in the split line inside the AFC. Next, remove the joint on the upper stream of the filter. If the pressure decreases, the filter is clogged. Prepare a new filter. Next, remove the joint on the upper stream of the buffer. If the pressure decreases, the buffer is clogged. If the pressure does not decrease, the cause originates in the INJ. Check the glass insert and the split line inside the INJ.
- Check that there is no clogging in the purge-line flow line.
  The inlet pressure sensor in the AFC is inside the purge line. If there is resistance in the purge line, the pressure may fluctuate.

(5) The inlet pressure is lower than the setting (in split mode).

- Check for leaks using, for example, a snoop.
- Check whether or not the total flow rate is controlled in accordance with the setting. If it is not, perform the checks described previously in items (1) to (3).
- Check that the source pressure (i.e., the primary pressure) has attained a sufficient level. The source pressure can be ascertained by viewing the "Actual" value for the primary pressure in the Flow Adjust window. It is not

necessary to remove any piping. Check that the set pressure is sufficiently higher than the primary pressure. (As a rough guide, it should be at least 200 kPa, but this value depends on the column.)

- Check whether or not the setting is within the range of settable pressures/flow rates for AFCs. (A graph is given in the section on AFCs in the GC-2014 instruction manual.)

(6) The pressure is higher than the setting (in split mode).

- Check whether or not the setting is within the range of settable pressures/flow rates for AFCs. (A graph is given in the section on AFCs in the GC-2014 instruction manual.)
- Check that a blind has not been erroneously attached to a split bent.
- Check that I time = 1, P term = 100, and I term = 150.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 6,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.
- Set the inlet pressure to 0 kPa and the total flow rate to 400 mL/min. At this time, pressure is generated due to the flow-line resistance of the split line. The specified value for this pressure is 50 kPa or less. (Normally 30 kPa.) If it is greater than 50 kPa, identify the place where resistance exists using the following procedure.
  Remove the AFC's piping-line joint with the "s" mark band, one piece at a time. If the pressure decreases when the joint on the lower stream of the filter is removed, resistance exists in the split line inside the AFC. Next, remove the joint on the upper stream of the filter. If the pressure decreases, the filter is clogged. Prepare a new filter. Next, remove the joint on the upper stream of the buffer. If the pressure decreases, the buffer is clogged. If the pressure does not decrease, the cause originates in the INJ. Check the glass insert and the split line inside the INJ.
- If a glass insert for WBI is used, set the column insertion length (normally 34 mm) to approx. 15 mm.

(7) The purge flow rate does not agree with the setting.

- Check that the column inlet pressure is sufficiently high.
  A column inlet pressure of approx. 4 kPa is required for a purge flow rate of 1 mL/min. This means that, in analysis with an inlet pressure of 8 kPa, the purge flow rate cannot be set higher than 2 mL/min.

- Check that I time = 10, P term = 50, and I term = 100.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 7,000 to 12,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.

7.1.1.2 When the control mode is "TOTAL FLOW" and the injection mode is "DIRECT":

(1) The total flow rate fluctuates.

(2) The total flow rate is lower than the setting.

(3) The total flow rate is higher than the setting.

Refer to items (1) to (3) under 7.1.1.1.

7.1.1.3 When the control mode is "PRESS" or "LINEAR VELOCITY" and the injection mode is "DIRECT":

(1) The pressure or the linear velocity fluctuates.

- Check that P-mode I time = 10, P-mode P term = 50, and P-mode I term = 100.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM. If the AFC for WBI is used, the above values are as follows: P-mode I time = 10, P-mode P term = 12, and P-mode I term = 10.
- Check that there is no clogging in the purge-line flow line.
  The inlet pressure sensor in the AFC is inside the purge line. If there is resistance in the purge line, the pressure may fluctuate.

(2) The pressure or the linear velocity is lower than the setting.

- Check for leaks in the line.
- Check that the source pressure (i.e., the primary pressure) has attained a sufficient level. The source pressure can be ascertained by viewing the "Actual" value for the primary pressure in the Flow Adjust window. It is not necessary to remove any piping. Check that the set pressure is sufficiently higher than the primary pressure. (As a rough guide, it should be at least 200 kPa, but this value depends on the column.)
- Check that P-mode I time = 10, P-mode P term = 50, and P-mode I term = 100.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM. If the AFC for WBI is used, the above values are as follows: P-mode I time = 10, P-mode P term = 12, and P-mode I term = 10.

- Check the offset and gain values.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 6,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.
- Check that the status is not "Flow off" or "System off".
  If 0 is displayed as the valve voltage, this indicates that there is no voltage being supplied from the control system to the valve (TFC, Total Flow Controller) that is attempting to supply carrier gas to INJ.

(3) The pressure or the linear velocity is higher than the setting.

- Check that P-mode I time = 10, P-mode P term = 50, and P-mode I term = 100.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM. If the AFC for WBI is used, the above values are as follows: P-mode I time = 10, P-mode P term = 12, and P-mode I term = 10.
- Check the offset and gain values.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 6,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.

7.1.1.4 Precautions for Flow-Rate Control Settings (DetAPC)

(1) The pressure or flow rate fluctuates.

- Check that I time = 10, P term = 50, and I term = 20.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check that the source pressure is not fluctuating.
- If the source pressure is shared (e.g., the helium carrier gas is used for the detector's make-up gas and carrier gas), check for pressure fluctuations in the other line.

(2) The pressure or flow rate is lower than the setting.

- Check for leaks in the line.
- Check that the source pressure (i.e., the primary pressure) has attained a sufficient level.
- Check that I time = 10, P term = 50, and I term = 20.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values for the pressure.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 10,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.
- Check the settings to confirm that, for example, APC is not "off" and that the ignition operation has not been forgotten.
  If 0 is displayed as the valve voltage, this indicates that there is no voltage being supplied from the control system to the valve that is attempting to supply gas.

(3) The pressure or the linear velocity is higher than the setting.

- Check that I time = 1, P term = 50, and I term = 20.
  If the values are different from the above values, input these values and press the pf4 key to write them in the ROM.
- Check the offset and gain values for the pressure.
  The offset value is normally in the range 32,000 to 33,500 and the gain value is normally in the range 3,000 to 10,000. If the offset value is well outside this range, perform offset calibration. (The method is described in the GC-2014 instruction manual.) If the gain value is well outside this range, obtain the correct value from Shimadzu Corporation's Quality Assurance Department. At this time, provide notification of the serial number and lot number displayed on the side of the AFC.

Also, it may be possible to stop fluctuation by changing the P term or the I term (to a value several times, or a fraction of, the original value). Use this method to stop fluctuation in urgent cases.

7.2 Temperature Control

The temperature does not rise, or does not agree with the setting.

Cause	Countermeasure
Overheating was detected and an error was generated.	Check for burnout in, and check the EMF of, the oven thermocouple. If either of these is the cause of the error, replace the oven thermocouple. The EMF at both ends of the thermocouple connector is equal to 40 µV multiplied by the difference, measured in ºC, between the local temperature and the ambient temperature.
The column's set temperature is higher than the detector's set temperature.	The software automatically ensures that the column temperature does not exceed the detector temperature. Set the detector's set temperature higher than the column's set temperature.
The sample injection port or the detector is not set to line configuration.	Temperature control is not possible for units not set to line configuration. Set the corresponding unit to line configuration.

7.3 Detector

7.3.1 FID

1. Ignition is not possible.

Cause	Countermeasure
The igniter filament has burnt out.	Replace the igniter. (Refer to *4.11.2 Maintenance/Inspection* in the instruction manual.)
There is a fault in the igniter circuit.	Check the voltage at both ends of the connector (between 1 (+) and 2 (−) of CN2) at ignition with the igniter filament connected. If a DC voltage of approx. 2 V is not output approx. 10 s after "Ignition started" or "Ignition is retried", then there is a fault in the ignition circuit. Replace the FID control board.
The nozzle is clogged with the sample or the graphite ferrule residue.	Clean (using, for example, CLEANING WIRE, 201-79229-01) or replace the nozzle. (Refer to *4.11.2 Maintenance/Inspection* in the instruction manual for details on mounting and removing the nozzle.)

2. There is a lot, or a high level, of noise.

Cause	Countermeasure
The collector is dirty.	After removing the igniter, clean the metal portion of the collector in a liquid such as hexane. (Refer to 4.11.2 *Maintenance/Inspection* in the instruction manual for details on mounting and removing the collector.)
The H_2 flow rate is fluctuating.	Replace the APC.

7.3.2 FPD

1. Ignition is not possible.

Cause	Countermeasure
The igniter filament has burnt out.	Replace the igniter.

2. There is a lot, or a high level, of noise.

Cause	Countermeasure
There is a fault in the photomultiplier.	Replace the photomultiplier.
The H_2 flow rate is fluctuating.	Replace the APC.

7.3.3 FTD

1. The background current does not reach the set value in current mode and the count for the adjustment time does not start.

Cause	Countermeasure
There is insulation failure in the FTD electrode.	Check the background level in the ZERO-cleared state with the monitor main screen. If it remains greater than the product of the set current value and 20,000 μV (e.g., 60, 000 μV for a current setting of 3 pA), and shows no sign of falling, measure the insulation between the center pin of the FTD signal cable assembly's BNC connector ("B" in the FTD configuration diagram) and earth. If the insulation resistance is less than 10 MΩ, inspect or replace the FTD unit assembly. Check whether or not there is a problem with the insulators ("Reference No. 32" in the FTD configuration diagram) inside the FTD unit assembly.

2. There is a lot, or a high level, of noise.

Cause	Countermeasure
The metal plate on the collector cover is left open after checking the red-hot state of the alkali source.	Close the metal plate on the collector cover.
The H_2 flow rate is fluctuating.	Replace the APC.

7.4 Chromatogram and Data

1. Peaks are not output or are extremely small; general detector used.

Cause	Countermeasure
The channel for detector signal output and the signal cable connection (ANALOG OUT) do not agree (in the case of analog output).	Set the channel for detector signal output correctly. (Refer to 2.2 Outputting Aualog Signals to Chromatopac in Instruction Manal (Details))
Offset calibration of the detector signal has not been performed correctly (in the case of analog output).	Perform offset calibration of the detector signal correctly. (Refer to 2.2 Outputting Aualog Signals to Chromatopac in Instruction Manal (Details))
The data format setting for the detector signal is incorrect.	In the signal settings in "Configuration settings", set "Datafile" (data format) to "Chromatopac" in the case of the C-R8A and to "PC" in the case of GCsolution.
The analog signal-type setting is incorrect (in the case of analog output).	Set in accordance with the Chromatopac used. (Refer to 2.2 Outputting Aualog Signals to Chromatopac in Instruction Manal (Details))

2. Peaks are not output or are extremely small; FID used as detector.

Cause	Countermeasure
The hydrogen flame is out.	If the igniter filament is red hot even though the ignition operation is not being executed, this means that the hydrogen flame is out. Ignite the hydrogen flame.
The nozzle is clogged.	Clean (using, for example, CLEANING WIRE, 201-79229-01) or replace the nozzle. (Refer to 4.11.2 *Maintenance/Inspection* in the instruction manual for details on mounting and removing the nozzle.)
A high voltage is not output.	Set the detector to ON and check the voltage between the end of the nozzle (+) and earth (−). If a DC voltage of approx. 160 V (when measured using a tester with an impedance of 10 MΩ) is not output, it means that there is a fault in the high-voltage circuit or contact failure or disconnection in the high-voltage electrode assembly. Replace the FID control board or repair or replace the high-voltage electrode assembly.

3. Peaks are not output or are extremely small; FPD used as detector.

Cause	Countermeasure
The flow rate for hydrogen or air is inappropriate.	Check the actual measurement value of the flow rate for hydrogen or air and also check the piping to the detector.

4. Peaks are not output or are extremely small; FTD used as detector.

Cause	Countermeasure
Hydrogen is not flowing into the detector.	Check the actual measurement value of the flow rate for hydrogen or air and also check the piping to the detector.
The FTD collector has reached the end of its service life.	Replace the FTD collector.

7.5 Other Problems

1. The display is dark or goes out.

Cause	Countermeasure
Backlight ON/OFF or contrast has been adjusted inappropriately.	Readjust backlight ON/OFF and contrast.
The value set for automatic OFF operation of the backlight in "Other configuration settings" is inappropriate.	Change the value set for automatic OFF operation of the backlight.

2. Chromatopac is not started by GCSTART when the Chromatopac signal cable is used.

Cause	Countermeasure
The channel started by the link device code in "Configuration settings" is not ON.	Set the channel started to ON.

3. The sample injection unit and the detector are not recognized.

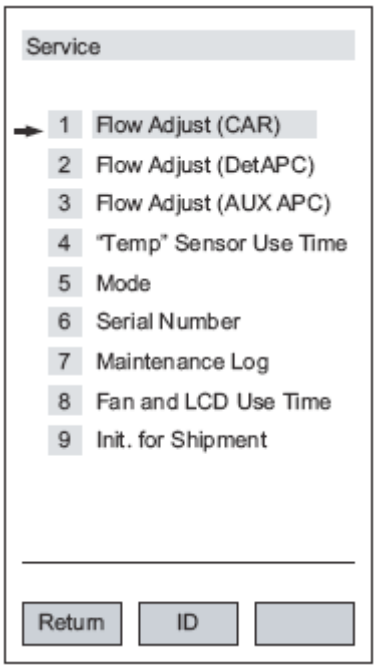
Cause	Countermeasure
There is contact failure or caulking failure in the recognized resistance for the sample injection unit or the detector.	Check the contact state and the caulking state of the recognized resistance. The recognized resistance values, measured between pins 1 and 2 on the connector, are as follows. SPL, WBI (both recognized as SPL): 1 kΩ FID, FTD (both recognized as FID): 221 kΩ TCD: 33 kΩ ECD: 47 kΩ FPD: 39 kΩ FTD-2014: 22 kΩ FTD-2014C: 22 kΩ FID DUAL: 27 kΩ
The temperature control port for the detector control unit to be used is not set.	Make the correct setting for the temperature control port for the detector control unit to be used under Function − Service/Maintenance − Installation (piping).

4. The baseline fluctuates when ready status is entered after sample injection.

Cause	Countermeasure
"Zero at Ready" is ON.	Either set "Zero at Ready" to OFF in the configuration settings or program so that ready status is not entered during analysis.

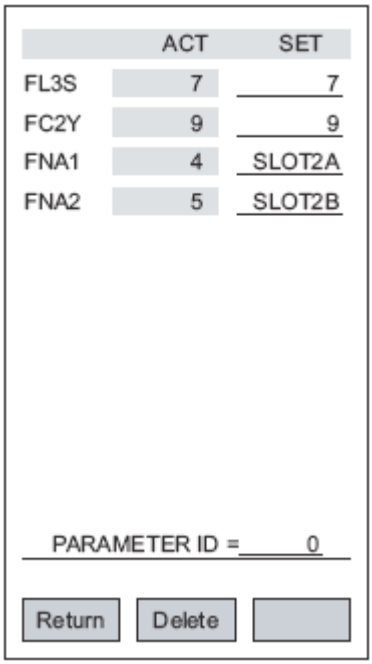
Chapter 8 Service Window

This chapter describes the service window that is displayed by pressing the FUNC key, selecting *7. Service/Maintenance − 5. Service*, and inputting the correct password in the password input window that is displayed.



pf2: Displays the ID window.

Pf2: ID Window

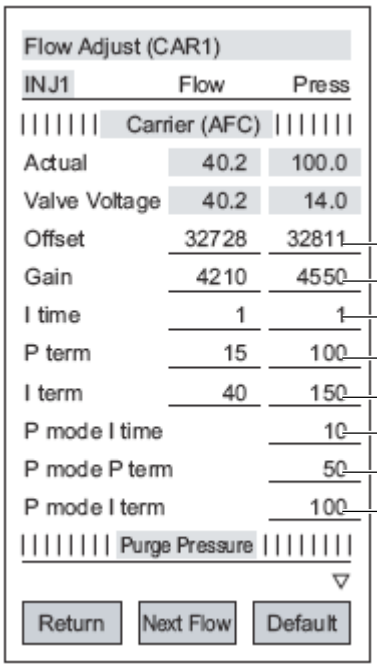


This single window can be used to check all the parameters.

Inputting a PARAMETER ID makes it possible to check the value of the corresponding parameter. When the cause of a fault is unknown, this function can be used to respond to requests such as "Check the value set for No. XXXX with the ID window" issued from our Quality Assurance Department.

It is planned that this window will be used for remote maintenance in the future.

8.1 Flow Adjust (CAR)



This window can be used to set the control parameters for the carrier-gas flow controller (DAFC for DINJ, AFC for SPL-2014, or AFC for WBI-2014).

If the set value and the actual measurement value of the flow rate or pressure differ, adjustment can be made by changing the *Offset* or *Gain* value.

- Sensor offset for carrier gas
- Sensor gain for carrier gas
- Default value
- Default value
- Default value
- Default value
- Default value of AFC for SPL (Default value of AFC for WBI is 12.)
- Default value of AFC for SPL (Default value of AFC for WBI is 10.)

pf4: ROM wrt
pf5: Offset
pf6: Prim Ofs

Explanation of pf Keys

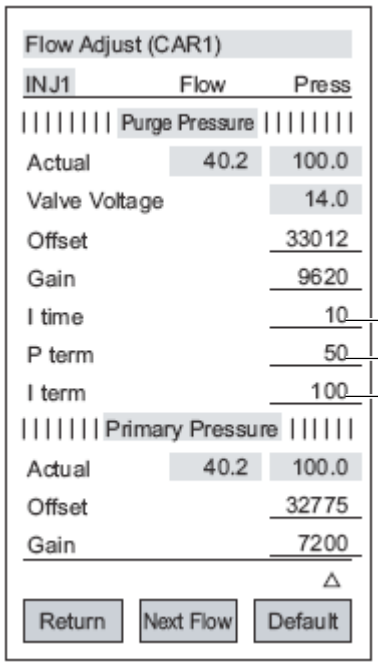
Default (pf3) ..... Resets all displayed parameters to their default values. (Not written to ROM.)

ROM wrt (pf4)..... Press this key to write the values set in this window, such as the offset and gain values, to ROM. The values are not set in ROM unless this key is pressed.

Offset (pf5) ..... Performs offset calibration of the pressure sensor, flow-rate sensor, and purge flow-rate sensor. Be sure to press this key to enable the calculated offset value.

PrimOfs (pf6)..... Performs offset calibration of the primary pressure sensor (pressure of supply to GC-2014).
When performing offset calibration, be sure to remove the GC-2014's carrier-gas supply piping from the GC-2014. Normally, the value should be in the range 32,000 to 33,000.

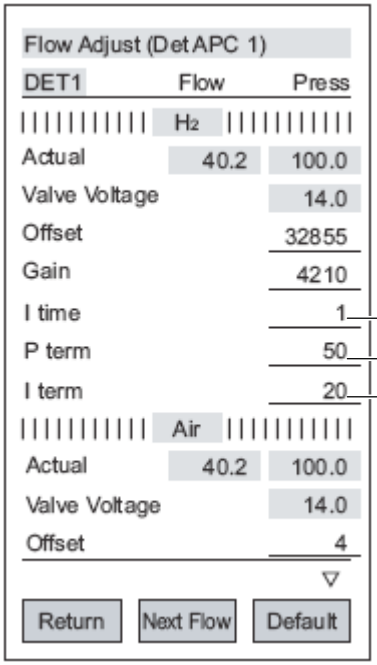
Continuation of Above Window



- Default value
- Default value
- Default value

pf4: ROM wrt
pf5: Offset
pf6: Prim Ofs

8.2 Flow Adjust (DetAPC) (Options only)



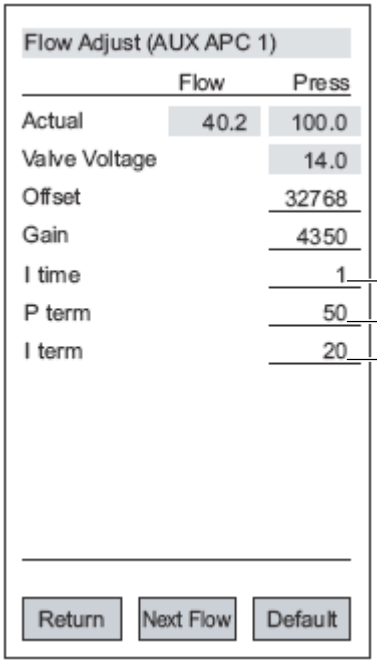
As an example, the window on the left shows the items displayed for H_2. The items are the same, however, for the APCs of air and make-up gas. The displayed contents may vary, however, depending on the type of Det APC.

- I time: Default value (same for air, H_2, and make-up gas)
- P term: Default value (same for air, H_2, and make-up gas)
- I term: Default value (same for air, H_2, and make-up gas)

pf4: ROM wrt

pf5: BASE, INJECTION UNIT A ASSY

8.3 Flow Adjust (AUX APC)



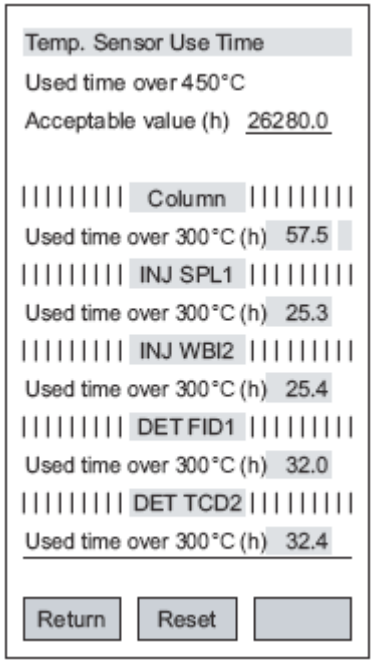
There is no display for AUX APCs that have not been installed.

- I time: Default value
- P term: Default value
- I term: Default value

pf4: ROM wrt

pf5: Offset

8.4 Temp. Sensor Use Time



This window is used to check or reset the temperature-sensor usage time for each unit.

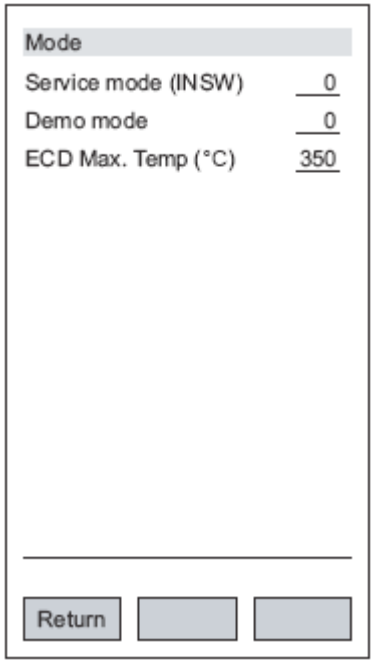
Note: The display items vary with the unit.

With the GC-2014, the time for which the temperature sensor has been used at a temperature of 300ºC or higher is calculated. As a rough guide, a warning is issued after approx. 26,280 hours (3 years).

Press pf2 after replacing the temperature sensor to reset the usage time.

pf2: Pressing "Reset" clears the counter at the cursor position.

8.5 Mode



Service mode (INSW): Be sure to set to 0 in normal use. In the following cases, however, temporarily set the corresponding value.

To increase the number of digits after the decimal point in the actual measurement value: 2

To stop the error confirmation window being displayed: 4

(To increase the number of digits and stop the error confirmation window being displayed: 6)

Demo mode: Be sure to set to 0 in normal use.

To make all the actual measurement values equal to the set values: 1

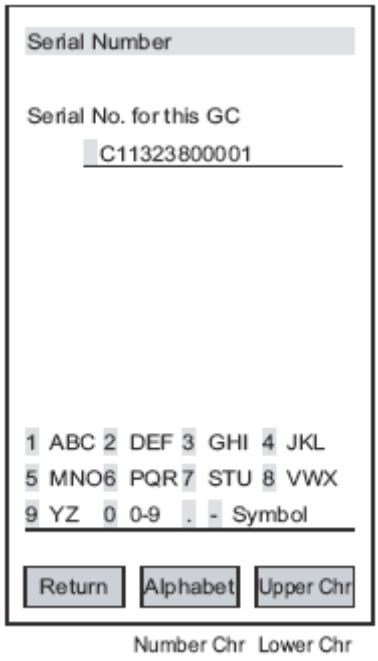
Note: This is to allow demonstrations in situations where there is no gas piping, such as exhibitions.

ECD Max. Temp (ºC): Default value is 350ºC.

In Japan, allowing the ECD temperature to exceed 350ºC is prohibited by law. This law does not apply overseas, however, and a temperature of up to 400ºC can be set. To be on the safe side, 350ºC was selected as the default value.

8.6 Serial Number

8.6.1 Main Body Serial Number

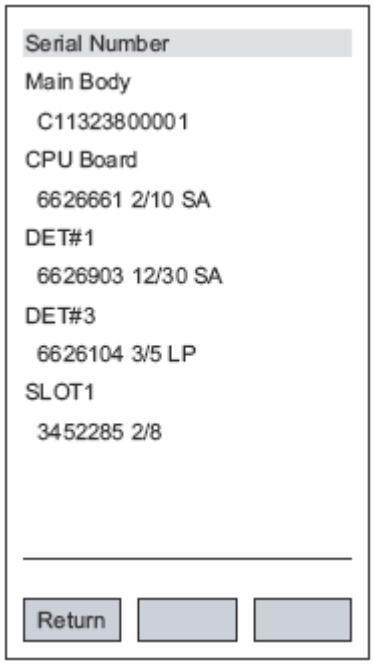


Up to 20 characters can be input.

The unit serial number is input before shipment. This information is shown on self-diagnostic reports. If, for some reason, the serial number does not appear, it can be input from this window.

The type of character can be changed using the pf2 and pf3 keys. The pf2 key is used to switch between alphabetical and numerical characters, and the pf3 key is used to switch between upper and lower case.

8.6.2 Unit Serial Numbers



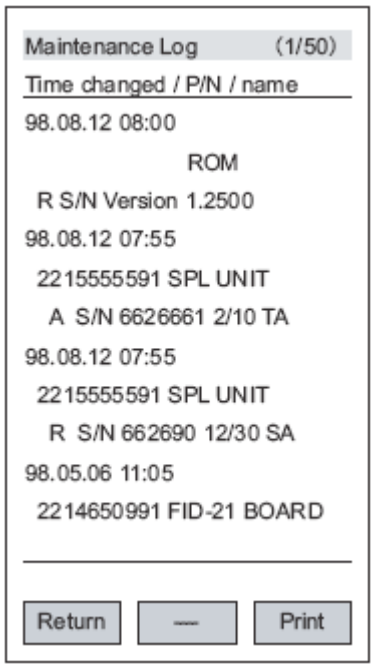
Note: The display items vary with the unit.

This window can be used to check the serial numbers written in ROM for automatically recognized units. There is no display for some units. For example, the serial number for a single injection unit (SPL unit) cannot be checked.

Information for DET#1 to DET#4 is displayed only for ports to which something is connected.

Information for SLOT#1 to SLOT#6 is displayed only for ports to which something is connected.

8.7 Maintenance Log



Records of board and flow-controller replacement and ROM version upgrades are stored. Up to 50 items can be recorded.

Note: Once the number of items reaches 50, the oldest item is deleted in order to allow new information to be recorded.

The letter that appears before "S/N" can be used to ascertain the attached/removed status of the corresponding part.

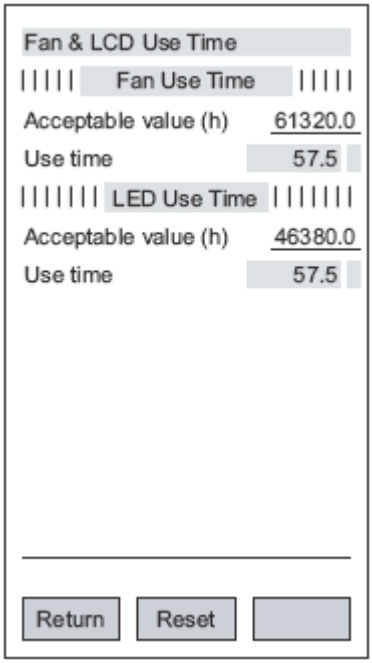
A: Attached

R: Removed

If all the information cannot be displayed together, the window can be scrolled.

The pf3 key is enabled when Chromatopac is connected.

8.8 Fan & LCD Use Time



This window is used to reset the operation times of the column-oven fan and the LCD unit.

Note: The settings for the "acceptable values" cannot be changed.

Fan: 61320.0 hours (approx. 7 years)

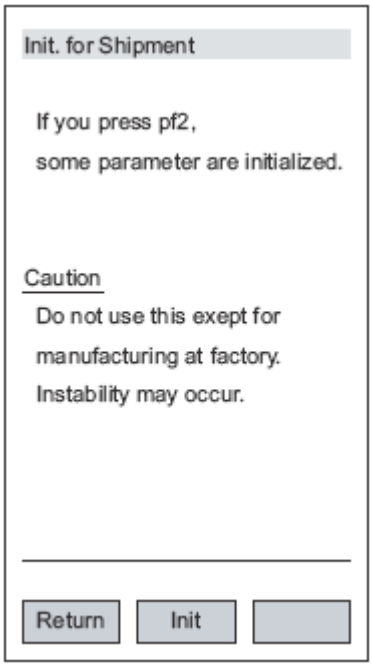
LCD: 46380.0 hours (approx. 5 years)

Operation beyond the period indicated by these acceptable values is possible, but a result of "Not Good" will appear in self-diagnostic reports.

After replacing the column-oven fan or the LCD unit, reset the corresponding operation time.

pf2: Pressing "Reset" clears the counter at the cursor position.

8.9 Init. for Shipment



This window is used only when being shipped from the factory.

CAUTION

- **Do not use this window.**

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Chapter 9 Appendix

Upgrade Procedure for GC-2014 CPU Board's ROM Software

The procedure for upgrading the GC-2014 CPU board's ROM software via RS-232C from a PC is explained below.

Items Required

(1) PC with Windows installed
(2) RC-232C cross cable for connecting GC and PC
(cross-cable type: 9-pin female to 9-pin female; e.g., P/N 228-35397-92)
(3) ROM file for updating

Checking Unit Settings

Before performing the version upgrade, make a note of the settings for the parameters listed below.

Note: These parameters can be checked by pressing the FUNC key and selecting the *7. Service/Maintenance* menu.

(1) *1. Installation (Position)* in the *Service/Maintenance* menu.
(2) *2. Installation (Piping)* in the *Service/Maintenance* menu.
Also, record the contents of the "analysis file" created by the customer for units not controlled by GCsolution.

Note: The contents of the analysis file do not have to be recorded when making a new installation (even if GCsolution is not connected).

Upgrade Procedure

(1) Turn OFF the power to the GC. If GCsolution is running, close GCsolution before turning OFF the power to the GC.
(2) Connect the GC and the PC using the RS-232C cross cable and start Hyper Terminal on Windows. Under *Connection Description* in Hyper Terminal, input an appropriate name and select an appropriate icon. In *Connect using*, select direct connection (e.g., *Direct to Com1*) to the port to which the RS-232C cable is connected (e.g., COM1 or COM2), and under *Port Settings*, set the parameters as shown below.
    - Baud rate: 115200
    - Data bits: 8
    - Parity: None
    - Stop bits: 1
    - Flow control: None

Note: After completing the settings, click OK and leave Hyper Terminal running.

(3) Start the GC while pressing the SET and HELP keys, and select *9 Enter sub menu* from the menu that appears. (Simply press the "9" key on the numeric keypad; it is not necessary to press the ENTER key.)
(4) Select *4 Set baud rate* and then select *7 115200*. (The display returns to the Boot Sub-menu.)

Note: At this point, the same contents are displayed in the GC and Hyper Terminal windows. If the GC window is not displayed in Hyper Terminal, press the PC's ENTER key.

(5) From Hyper Terminal, select *1 Update Flash ROM*, select *Transfer* from the menu, and then select *Send File* from the pull-down menu.
(6) Specify the name of the ROM file for updating as the filename (extension: ROM), select *Ymodem-G* as the protocol, and then click *Send*.

Note: The ROM file is sent and the GC's ROM is automatically upgraded. If the file's send status or the ROM's upgrade status is not displayed, or the display returns to the Boot Sub-menu before clicking *Send*, go back to step 4 and repeat the subsequent procedure.

(7) Select *9* to return to the Boot Menu and select *0*. The GC runs in normal mode. Close Hyper Terminal.
(8) Press the FUNC key and then press the pf1 key (*Version*). Check that the *Version* and *Build No* displayed correspond to those for the new version. If the displayed contents correspond to the old version, repeat the upgrade procedure from the beginning.

(9) After reconfirming the *Installation (Position)* and *Installation (Piping)* parameters that were recorded before the version upgrade (or after resetting them, if they have been deleted), reset the unit's power supply. (This is because changes in condition settings, such as the *Installation (Position)* and *Installation (Piping)* parameters, are only enabled when the power supply is reset.)

(10) Press the FUNC key and select *3. Transmission parameter settings* from the *6. Configuration settings* menu. Set the transmission parameters. (After selecting the values, be sure to press the ENTER key to confirm the selections.) After completing the settings, be sure to press the pf2 key (*Apply*).

When using GCsolution:
Protocol: LEVEL3; Baud rate (bps): 115,200 bps

Note: When connecting to Chromatopac, set the GC-2014's transmission parameters to the same values set for Chromatopac.

(11) For units controlled from GCsolution, download the device parameters from the PC to the GC. For units not connected to GCsolution, check the contents of the analysis file, and return the parameters to the values taken before the upgrade.

Note: With new installations (even if GCsolution is not connected), it is not necessary to re-input the contents of the analysis file.

This completes the upgrade procedure.

Note: If a communications error occurs with the baud rate set to 115,200 bps, lower the baud rate before repeating the upgrade procedure.